To: Jackson, Ryan[jackson.ryan@epa.gov]
Cc: Doug Deason[doug@deasoncap.com]
From: Doug Deason
Sent: Tue 8/1/2017 1:27:12 PM
Subject: Fwd: EPA names
Dr. Michael Honeycutt - bio and testimonies.pdf
ATT00001.htm
Biography List.pdf
ATT00002.htm

Good morning Ryan,
Here is the list of recommendations for the Science Advisory Panel from TPPF. Let us know if you have any questions.
Have a great day!
Doug Deason

Begin forwarded message:

From: "Robert Henneke" <rhenneke@texaspolicy.com>
To: "Doug Deason" <doug@deasoncap.com>
Cc: "Brooke Rollins" <brollins@texaspolicy.com>
Subject: EPA names

Doug, here's the list of names that we recommend for EPA. Thanks,

Rob

From: Kevin Roberts <kroberts@texaspolicy.com>
Date: Wednesday, July 19, 2017 at 3:55 PM
To: Doug Deason <doug@deasoncap.com>, Robert Henneke <rhenneke@texaspolicy.com>
Subject: Science Advisory Names

Here you go. We'd particularly recommend Dr. Bryan Shaw.

From: Kevin Roberts <kroberts@texaspolicy.com>
Date: Friday, May 19, 2017 at 2:26 PM
To: Doug Deason <doug@deasoncap.com>
Subject: FW: Completed bios

Doug:

Please see attached, from KHW's awesome policy analyst Megan Ingram. Please let me know if you need anything else.

Hope you're trip was great. Thanks again for being such a TPPF advocate!

Kevin

From: Megan Ingram <mingram@texaspolicy.com>
Date: Friday, May 19, 2017 at 12:37 PM
To: Kevin Roberts <kroberts@texaspolicy.com>
Cc: Kathleen Hartnett White <khwhite@texaspolicy.com>
Subject: Completed bios

Hi Kevin,

Here is the list of names and associated bios that Kathleen has compiled. She especially recommends Dr. Michael Honeycutt of the TCEQ, so we have listed his bio first on the main list of the entire group, and have also included a separate document exclusively for him – including his bio and two testimonies to Congress.

Please take a look and let me know if there's anything I can change.

Thank you,

Megan

To: Jackson, Ryan[jackson.ryan@epa.gov]
Cc: Smith, Keith[Keith.Smith@prime-policy.com]; Black, Charlie[Charlie.Black@prime-policy.com]; Peck, Gregory[Peck.Gregory@epa.gov]
From: Rozsa, Gabe
Sent: Thur 6/15/2017 6:34:19 PM
Subject: New Hanover County Water Issue
GenX-Health-Effects-Summary-DHHS-6_12_17-PDF.pdf

Ryan,

Thank you for your willingness to assist New Hanover County on this critical water issue. Here some additional background on the matter.

Press reports in early June indicated the existence of the chemical GenX in the drinking water supply of the residents in New Hanover County and other southeast North Carolina counties. New Hanover County, under the leadership of Woody White, Chairman of the County Commission, organized an immediate inquiry and action plan for addressing the concerns of the residents of the Wilmington area about whether the levels found pose any health threat. The local officials are also asking for help from relevant State agencies (see attached Cape Fear Public Utility Authority letter of June 7th). At the County's request, NC Department of Health and Human Services (NC-DHHS) and the North Carolina Department of Environmental Quality (NC-DEQ) have responded to the need for more information about the chemical and its regulation as summarized in the release posted yesterday by NC-DEQ (http://deq.nc.gov/deq-dhhs-investigating-reports-unregulated-chemical-cape-fear-river).

I believe North Carolina is a delegated state for water programs but my understanding is that the issue at hand may also involve an earlier enforcement agreement entered into between the previous owner of the facility producing GenX and the EPA. I believe there was a call this week between New Hanover County Officials, NC DEQ and the Atlanta Regional Office of the EPA. Also, detailed questions have been submitted to EPA HQ about this chemical and related enforcement issues.

On Monday, the NC-DHHS released a health effects statement on GenX to county public health directors. The statement, attached above, was prepared for the NC-DEQ by the Occupational and Environmental Epidemiology Branch of NC-DHHS. NC-DEQ and the community at large is working to understand the human health effects of GenX, and the health effects statement. Based on the information available thus far from all sources, NC-DEQ issued a statement summarizing what was known to include the following:

"There are no U.S. regulatory guideline levels for GenX. However, as part of the European chemical registration, a 2-year chronic toxicity and cancer study with rats was performed. They reported a Derived No Effect Level (DNEL) of 0.01 mg/kg bw/day. Based on U.S. risk assessment calculations, this corresponds to a concentration in drinking water of 70,909 ng/L of GenX- more than 100 times greater than the mean value of 631 ng/L detected in the Cape Fear River. Based upon these data, the GenX levels detected in 2013-2014 would be expected to pose a low risk to human health."

This statement begins to shed light on human health risks from GenX, but it does not eliminate the county's concern that this unregulated compound has been found in the community's drinking water supply, especially in light of lower standards established by EPA for related chemicals.

New Hanover County officials are asking that the EPA and DEQ work to provide the residents and the state agencies involved with the best available information about the health threats posed.

Ryan, we appreciate your willingness to help. A statement from your office that you are working quickly and cooperatively with all parties, including New Hanover County elected officials, Members of Congress, NC-DEQ and EPA staff (both Region and HQ), would help ease the concerns in the current climate.

Thank you for your assistance.

Gabe

Gabe Rozsa

Managing Director

1110 Vermont Avenue, NW | Suite 1000 | Washington, DC 20005

202 530 4843 | Fax: 202 530 4800 | Cell: 202 701 7710

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Prepared by the Occupational and Environmental Epidemiology Branch, NC DHHS

June 12, 2017

- GenX is a chemical used in the manufacturing of fluoropolymer resins, which are used for nonstick coatings and other purposes. GenX is part of the perfluorinated family of compounds that includes the chemicals PFOS and PFOA. In 2009, GenX was developed as a replacement for PFOA thus limited health information is available for GenX.

- According to media reports, the GenX in the Cape Fear River is originating from Chemours Co. at Fayetteville Works, a facility 100 miles upstream from Wilmington. GenX has been detected in water treated by the Cape Fear Public Utility Authority as detailed in the article by Sun et al.[1]

- The recent media reports on GenX in the Cape Fear River are associated with the paper written by Sun et al. This paper was published in November 2016. Media reports cite 631 ng/L concentrations of GenX detected in the Cape Fear River. This number is taken from the Sun et al. article based on data from 2013-2014. It is not known whether these levels reflect the current concentrations of GenX in the Cape Fear River.

- Limited health information is available for GenX. PFOA and PFOS (chemicals that are part of the same family of fluorinated compounds) were recently reviewed by the EPA and the most common effects observed in laboratory tests were kidney and testicular cancer, impaired fetal development, and effects on the liver, thyroid, and immune system. The EPA recently released a Health Advisory with recommendations for drinking water not to exceed 70 parts per trillion (70 ng/L) for PFOS and PFOA combined.[2]

- There are no U.S. regulatory guideline levels for GenX. However, as part of the European chemical registration, a 2-year chronic toxicity and cancer study with rats was performed. They reported a Derived No Effect Level (DNEL) of 0.01 mg/kg bw/day. Based on U.S. risk assessment calculations, this corresponds to a concentration in drinking water of 70,909 ng/L of GenX- more than 100 times greater than the mean value of 631 ng/L detected in the Cape Fear River. Based upon these data, the GenX levels detected in 2013-2014 would be expected to pose a low risk to human health.

- This summary covers GenX only and does not address other poly- or perfluorinated compounds that might be present. This summary is preliminary and subject to change as additional information becomes available.

1. Sun et al. Legacy and Emerging Perfluoroalkyl Substances Are Important Drinking Water Contaminants in the Cape Fear River Watershed of North Carolina. Environmental Science & Technology Letters. Nov 2016. DOI: 10.1021/acs.estlett.6b00398.
2. USEPA. Drinking Water Health Advisories for PFOA and PFOS. https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos

To: Jackson, Ryan[jackson.ryan@epa.gov]
From: danielle quist
Sent: Mon 7/24/2017 6:58:16 PM
Subject: Danielle Quist LD2 2017
Danielle Quist 2017 LD2.pdf

Ryan, here are the LD2s for 2017. We are in the process of filing an amended report that will impact several issues, including the topics that list my name (removing my name from several topics). That amendment will take several more days but I wanted to get something to you today. I sent the 2015 and 2016 forms Friday. I will send along the amended form as soon as it is filed.
Regards,
Danielle Quist

LOBBYING ACTIVITY. Select as many codes as necessary to reflect the general issue areas in which the registrant engaged in lobbying on behalf of the client during the reporting period. Using a separate page for each code, provide information as requested. Add additional page(s) as needed.

15. General issue area code CAW

16. Specific lobbying issues

Support S. 2526/ H.R. 4957 Commonsense Legislative Exceptional Events Reform (CLEER) Act
S. 1000 - Chesapeake Bay Accountability and Recovery Act of 2013
H.R.935 - Support "Reducing Regulatory Burdens Act of 2014, to amend FIFRA and the Clean Water Act
Oppose "Climate Action Plan"
Oppose EPAs TMDL vision strategy
National Environmental Policy Act (NEPA)
Support water rights protection Act, S982, HR 1830
Oppose OZONE Regulations

17. House(s) of Congress and Federal agencies ☐ Check if None

U.S. SENATE, U.S. HOUSE OF REPRESENTATIVES, Environmental Protection Agency (EPA), Army - Dept of (Corps of Engineers), Agriculture - Dept of (USDA), U.S. Forest Service

18. Name of each individual who acted as a lobbyist in this issue area

First Name	Last Name	Suffix	Covered Official Position (if applicable)	New
Dale	Moore			☐
Don	Parrish			☐
Ryan	Yates			☐
Andrew	Walmsley			☐
Danielle	Quist			☐
Bob	Young			☐
Paul	Schlegel			☐
Veronica	Nigh			☐
Cody	Lyon			☐

19. Interest of each foreign entity in the specific issues listed on line 16 above ☑ Check if None

LOBBYING ACTIVITY. Select as many codes as necessary to reflect the general issue areas in which the registrant engaged in lobbying on behalf of the client during the reporting period. Using a separate page for each code, provide information as requested. Add additional page(s) as needed.

15. General issue area code NAT

16. Specific lobbying issues

Oppose Groundwater Resource Management Directive
Support expansion of H.R.1667. to increase transparency of ESA
Oppose U.S. Fish and Wildlife Service and National Oceanographic and Atmospheric Administration National Marine Fisheries Service effort to modify ESA critical habitat designation process
Support Prelisting conservation actions
H.R.2647, Resilient Federal Forests Act (Support)
Grazing Improvement Act (passed, signed law)
H.R. 3946-Protecting Local Communities from Executive Overreach Act
S2004-A bill to amend section 320301 of title 54, United States Code, to modify the authority of the President of the United States to declare national monuments, and for other purposes.

17. House(s) of Congress and Federal agencies ☐ Check if None

U.S. HOUSE OF REPRESENTATIVES, U.S. Forest Service, U.S. Fish & Wildlife Service (USFWS), Natl Oceanic & Atmospheric Administration (NOAA)

18. Name of each individual who acted as a lobbyist in this issue area

First Name	Last Name	Suffix	Covered Official Position (if applicable)	New
Dale	Moore			☐
Ryan	Yates			☐
Danielle	Quist			☐
Paul	Schlegel			☐

19. Interest of each foreign entity in the specific issues listed on line 16 above ☑ Check if None

LOBBYING ACTIVITY. Select as many codes as necessary to reflect the general issue areas in which the registrant engaged in lobbying on behalf of the client during the reporting period. Using a separate page for each code, provide information as requested. Add additional page(s) as needed.

15. General issue area code RES

16. Specific lobbying issues

Support H.R.1667-21st Century Endangered Species Transparency Act
Support H.R.3162-Endangered Species Recovrey Transparency Act
Support H.R.2352-State, Tribal and Local Species Transparency and Recovery Act
Support H.R.2109-Endangered Species Litigation Reasonableness Act

17. House(s) of Congress and Federal agencies ☐ Check if None

U.S. HOUSE OF REPRESENTATIVES, Agriculture - Dept of (USDA), U.S. Fish & Wildlife Service (USFWS)

18. Name of each individual who acted as a lobbyist in this issue area

First Name	Last Name	Suffix	Covered Official Position (if applicable)	New
Dale	Moore			☐
Ryan	Yates			☐
Danielle	Quist			☐
Paul	Schlegel			☐

19. Interest of each foreign entity in the specific issues listed on line 16 above ☑ Check if None

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S. 1000 - Chesapeake Bay Accountability and Recovery Act of 2013
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Oppose "Climate Action Plan"
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Support water rights protection Act, S982, HR 1830
Oppose OZONE Regulations

17. House(s) of Congress and Federal agencies ☐ Check if None

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18. Name of each individual who acted as a lobbyist in this issue area

First Name	Last Name	Suffix	Covered Official Position (if applicable)	New
Dale	Moore			☐
Don	Parrish			☐
Ryan	Yates			☐
Andrew	Walmsley			☐
Danielle	Quist			☐
Bob	Young			☐
Paul	Schlegel			☐
Veronica	Nigh			☐
Cody	Lyon			☐

19. Interest of each foreign entity in the specific issues listed on line 16 above ☑ Check if None

LOBBYING ACTIVITY. Select as many codes as necessary to reflect the general issue areas in which the registrant engaged in lobbying on behalf of the client during the reporting period. Using a separate page for each code, provide information as requested. Add additional page(s) as needed.

15. General issue area code LBR

16. Specific lobbying issues

Object to Department of Labor abuse of hot good orders against specialty crop producers.
H.R.4-Jobs for America Act
Support H.R.1387 to amend the Fair Labor Standards Act of 1938 to exempt certain perishable agricultural commodities from the goods whose sale or distribution in commerce may be prohibited subsequent to FLSA violation.
H.R.2575-Save American Workers Act
H.R.5392-The Fairness for Farmers Act (excludes H-2A workers from the PPACA employer mandate)
S.2881-Simplifying Technical Aspects Regarding Seasonality (STARS)Act of 2014
H.R.5213-Simplifying Technical Aspects Regarding Seasonality (STARS)Act of 2014
Promote farm safety
OSHA Ag Retailer Process Safety Management
Port Labor Issues

17. House(s) of Congress and Federal agencies ☐ Check if None

U.S. SENATE, U.S. HOUSE OF REPRESENTATIVES, Labor - Dept of (DOL), Occupational Safety & Health Administration (OSHA)

18. Name of each individual who acted as a lobbyist in this issue area

First Name	Last Name	Suffix	Covered Official Position (if applicable)	New
Dale	Moore			☐
Patricia	Wolff			☐
Bob	Young			☐
Andrew	Walmsley			☐
Veronica	Nigh			☐
Danielle	Quist			☐

19. Interest of each foreign entity in the specific issues listed on line 16 above ☑ Check if None

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15. General issue area code NAT

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Oppose Groundwater Resource Management Directive
Support expansion of H.R.1667. to increase transparency of ESA
Oppose U.S. Fish and Wildlife Service and National Oceanographic and Atmospheric Administration National Marine Fisheries Service effort to modify ESA critical habitat designation process
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Grazing Improvement Act (passed, signed law)
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S2004-A bill to amend section 320301 of title 54, United States Code, to modify the authority of the President of the United States to declare national monuments, and for other purposes.

17. House(s) of Congress and Federal agencies ☐ Check if None

U.S. HOUSE OF REPRESENTATIVES, U.S. Forest Service, U.S. Fish & Wildlife Service (USFWS), Natl Oceanic & Atmospheric Administration (NOAA)

18. Name of each individual who acted as a lobbyist in this issue area

First Name	Last Name	Suffix	Covered Official Position (if applicable)	New
Dale	Moore			☐
Ryan	Yates			☐
Danielle	Quist			☐
Paul	Schlegel			☐

19. Interest of each foreign entity in the specific issues listed on line 16 above ☑ Check if None

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15. General issue area code RES

16. Specific lobbying issues

Support H.R.1667-21st Century Endangered Species Transparency Act
Support H.R.3162-Endangered Species Recovrey Transparency Act
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Support H.R.2109-Endangered Species Litigation Reasonableness Act

17. House(s) of Congress and Federal agencies ☐ Check if None

U.S. HOUSE OF REPRESENTATIVES, Agriculture - Dept of (USDA), U.S. Fish & Wildlife Service (USFWS)

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Ryan	Yates			☐
Danielle	Quist			☐
Paul	Schlegel			☐

19. Interest of each foreign entity in the specific issues listed on line 16 above ☑ Check if None

Supreme Court of the United States

INSTRUCTIONS FOR ADMISSION TO THE BAR

Attached is the application form for your personal statement, as required by Supreme Court Rule 5.2, including space for endorsement by two sponsors. The sponsors must be members of the Bar of this Court who know you personally and are **not** related to you by blood or marriage. **One of the sponsors or another member of the Bar, including a relative, may move your admission.** Please indicate the name you want shown on the certificate which may or may not include a middle name and/or suffix.

You must obtain a **certificate of good standing from the presiding judge, clerk, or other authorized official of the highest court** of a State, Commonwealth, Territory or Possession, or of the District of Columbia, evidencing the fact that you have been a member of the Bar of such court for at least three years and are in good standing. An application will be considered current for one year from the date of the clerk's certificate. After that time the papers will be returned. **Do not submit a Bar Association certificate in place of the clerk's certificate, or a duplicate of a certificate of good standing.**

Supreme Court Rule 5 provides, in part:

1. To qualify for admission to the Bar of this Court, an applicant must have been admitted to practice in the highest court of a State, Commonwealth, Territory or Possession, or the District of Columbia for a period of at least three years immediately before the date of application; must not have been the subject of any adverse disciplinary action pronounced or in effect during that 3-year period; and must appear to the Court to be of good moral and professional character.

2. Each applicant shall file with the Clerk (1) a certificate from the presiding judge, clerk, or other authorized official of that court evidencing the applicant's admission to practice there and the applicant's current good standing, and (2) a completely executed copy of the form approved by this Court and furnished by the Clerk containing (a) the applicant's personal statement, and (b) the statement of two sponsors endorsing the correctness of the applicant's statement, stating that the applicant possesses all the qualifications required for admission, and affirming that the applicant is of good moral and professional character. Both sponsors must be members of the Bar of this Court who personally know, but are not related to, the applicant.

3. If the documents submitted demonstrate that the applicant possesses the necessary qualifications, and if the applicant has signed the oath or affirmation and paid the required fee, the Clerk will notify the applicant of acceptance by the Court as a member of the Bar and issue a certificate of admission. An applicant who so wishes may be admitted in open court on oral motion by a member of the Bar of this Court, provided that all other requirements for admission have been satisfied.

4. Each applicant shall sign the following oath or affirmation: I, ... , do solemnly swear (or affirm) that as an attorney and as a counselor of this Court, I will conduct myself uprightly and according to law, and that I will support the Constitution of the United States.
All original signatures must be on one page together.

IF YOU ELECT TO BE ADMITTED ON WRITTEN MOTION, without coming to the Court, please execute the Motion For Admission by having the attorney whose name you wish to appear on your certificate sign as the moving party. The attorney who moves your admission must be a member of the Bar of this Court and may be a relative. Return to the Clerk's Office, Attn: Admissions Office, your completed application, the required certificate, and your check for $200 payable to "U. S. Supreme Court" to cover the admission fee.

IF YOU ELECT TO BE ADMITTED IN OPEN COURT, do not complete the written Motion For Admission. Return your application and the required certificate to this Office, and we will notify you whether the papers are in order and will provide instruction for being admitted in open Court. The $200 fee is to be paid on the day of admission.

BAR CERTIFICATE. The Certificate evidencing admission to the Bar of this Court contains the following words: ". . . in the year of our Lord, two thousand." An alternate Certificate is available that omits the underlined words. If you want an alternate Certificate, check the block on the application form.

Admissions Office:
202-479-3387
ptadmit@supremecourt.gov

PLEASE RETURN TO:
Clerk, Supreme Court of the United States
Attn: Admissions Office
1 First Street, N. E.
Washington, D. C. 20543-0001

To: Flynn, Mike[Flynn.Mike@epa.gov]; Edwards, Jonathan[Edwards.Jonathan@epa.gov]; Rowson, David[Rowson.David@epa.gov]; Etzel, Ruth[Etzel.Ruth@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]
Cc: Claire Barnett[cbarnett@healthyschools.org]
From: Claire Barnett
Sent: Fri 7/14/2017 7:39:14 PM
Subject: re EPA FY 18 budget
CHS- Infra -EH - caring for children feb 2017 -sigs.pdf
CHS- EPA FY18 approps May 22, 2017- sign ons.pdf
CHS- EPA $65M budget March 2017.pdf

Mike Flynn, Acting Dpty Administrator

Ryan Jackson, CoS to Administrator Pruitt

Jon Edwards, Acting Admin for OAR

Dave Rowson, Director, Indoor Environments

Ruth Etzel, MD, Director, OCHP

BACK TO SCHOOL

While the world is consumed with other issues, the nation's children are still returning to local schools – to school buildings that have earned a "D" rating from the Am. Society of Civil Engineers.

In COLORADO, my grandchildren start on August 16th, so it isn't too early to think about these buildings.

Consistent with our May 25th meeting at EPA and subsequent communications, our recommendation for the EPA FY 18 Budget is attached.

$1 per child enrolled in all schools and childcare arrangements, $65M, and recommended allocations for various programs: OCHP, Indoor Env, Water, Chemical Safety, Research.

The amount is less than a rounding error inside EPA, and an invisible budget item at the federal level, yet it would be sufficient to DISRUPT the current pattern of neglect: neglect of facilities and neglect of occupant health and safety.

Thank you

Claire L. Barnett

Att: Infrastructure and Children Policy Paper; Letter to Appropriators; memo/allocation of $65M

Claire L. Barnett, MBA, Founder and Executive Director

Healthy Schools Network, Inc.

(w) 518-462-0632

(m) 202-543-7555

Coordinator, National Coalition for Healthier Schools

...providing the platform and the forum for environmental health at school ... since 2001

HealthySchools.org – for children, health, environment, education and communities since 1995

NationalHealthySchoolsDay.org – celebrated every spring since 2002

CleaningforHealthySchools.org – green & healthy products for schools

COALITION FOR HEALTHIER SCHOOLS

Children Health and School/Child Care Infrastructure

Budget: for (Non-Construction) Programs at US EPA - $65 Million

Prepared by HS Network, March 2017

We deeply appreciate the interest our policy paper and related handouts have generated in this cross-cutting issue on the conditions of schools/child care centers and the risks to children's health and ability to learn. Importantly, members of congress have told us that they are aware that too many of our nation's school facilities are in poor condition and they have also told us that our schools do not always know how to prevent facility problems or how to address them once they arise. *EPA agrees.*

EPA? The federal voluntary guidance and grants on how to prevent and address school and child care facility problems has been managed on slender budgets by US EPA for nearly twenty years, as the attached EPA Voluntary Program Successes memo illustrates. EPA money has not built schools or repaired them, but the agency has provided federal leadership and grants to states, tribal nations, universities, and NGOs that have educated thousands of PK-12 and child care constituencies, school leaders, and personnel on achieving and maintaining healthy facilities. The deep expertise and the enthusiasm for this work lies in EPA's Office of Air and Radiation/Indoor Environments Division. EPA also supports pediatric environmental health research and public health services. Other EPA offices are also involved for their specific issue expertise, such as Chemical Safety and Pollution Prevention, Water, and Research.

Recommendation for EPA Program Budgets

EPA's myriad schools-focused guidance documents have been developed by expert staff in various program offices, not in one central location; none are line-itemed. Given that schools need to know how to prevent facility problems and how to make smart decisions on maintenance, repairs and renovations, **it is our recommendation, that now, in advance of any potential school allocation in a federal Infrastructure bill, EPA be funded at $65 Million annually above its existing funding allocated to addressing schools/child care settings and children's health. A proposed break down follows.**

Note on Other Agencies: ED and CDC

The US Department of Education has no office, no staff, and no expertise on school facilities; ESSA does not touch environmental hazards in schools or address facilities.

The federal Centers for Disease Control and Prevention has several relevant offices, but has historically deferred to EPA on the physical environment. CDC's Division of School Health mentions the physical environment, but has never offered tools or grants to address that, consistent with CDC's new-ish Whole School-Whole Child school health model which ignores the physical environment. CDC's National Center for Environmental Health/Agency for Toxic Substances and Disease Registry (NCEH/ATSDR) partners with EPA on children's health, as does the National Institutes of Environmental Health Sciences (NIEHS). CDC's National Institutes of Occupational Safety and Health (NIOSH) which is authorized to help workers, is aware that it is challenged by what it terms "hybrid workplaces" like schools, where the occupants in the workplace far outnumber the actual employees whose interests NIOSH can address.

$65 Million – Recommended Allocations

Office of Air and Radiation/Indoor Environment Division (OAR/IED) – $35 Million

- For federal leadership and coordination of a federal-state-NGO prevention partnership, inclusive of EPA other program offices, and other relevant federal agencies, and EPA grantees on children's health and on school/child care physical environments.
- Convening annual symposia for all federal offices participating, and for state/NGO grant partners to exchange information and learn more about problems, progress, and emerging opportunities
- Restore EPA's Indoor Air Quality Tools for School program and its grants, as well as EPA's other voluntary competitive grants to advance related guidelines and educational tools, including but not limited to: School IPM, School Chemical Clean Out, Cleaning and Maintenance for Schools, Radon, Clean School Bus, Design Tools for Schools, Energy Savings Plus Health, School Siting, and Healthy SEAT.
- Providing resources to EPA regional offices for regional grants to advance goals and objectives in this issue area
- National cooperative agreement grants and regional grants should be targeted at educating and building the nation's capacity to prevent school/child care facility problems and to address them effectively if they are found, with the following grantees:
    - Leading PK-12/child care and child health NGOs
    - City health agencies of top-20 largest school districts (NYC, LAUSD, Chicago, Houston, Philadelphia, Miami-Dade, etc,)
    - State education and or health agencies to adapt for state use Healthy SEAT, an assessment tool
    - Planning grants to states on healthy State School Environmental Health Guidelines should be in two phases - 1- an 18 month planning grant to establish state interagency plans for the state to improve school/child care facilities which may include facility assessments, tracking children's health and facility health, and benchmarking prevention; and 2- 2- year implementation grants, with commitment from the state for its own resources.

- OAR/IED should have staff and contractual resources sufficient to ensure the partnership succeeds and grants are managed effectively.

Office of Children's Health Protection (OCHP) – $5 Million

- Amplify its federal leadership on children's environmental health through Co-chairing the federal Task Force on Risks to Children's Environmental Health
- Expand cooperative agreement grant support for the Pediatric Environmental Health Specialty Units (PEHSUs), co-designated and co-funded with CDC-NCEH/ASTDR so that these units can assist states, cities, communities, schools, and parents with environmental information and assessments of school-based or child-care based risks. This may include setting aside a limited pool of funds to be used to reimburse pediatric environmental health experts in concert with city or state health agencies for onsite investigations of schools/child care facilities by qualified facility professionals
- In concert with OAR/IED state planning grants, add grant support to state health agencies targeted at implementing a tracking and intervention program to assist children at risk or with exposures in these settings Council of State and Territorial Epidemiologists have a new work group on this topic).
- OCHP should have staff and contractual resources sufficient to ensure the partnership succeeds and grants are managed effectively.

Water Quality - $5 Million

- Finalize and disseminate new guidance for child care and schools on contaminants in drinking water, following the guidance into the field with sustained voluntary grants to cites, states, key constituencies.
    - Create and maintain and enforce the use of an easily searchable online database for school/child care required reports on testing at the tap for contaminants in drinking water.
- Water Quality Office should have staff and contractual resources sufficient to ensure the partnership succeeds and grants are managed effectively.

Office of Chemical Safety and Pollution Prevention (OCSPP) - $10 Million

- Reducing risks from toxic chemicals and heavy metals in schools/child care requires updated guidance and grants targeted at the field on: PCBs, lead paint indoors and outside, asbestos, elemental mercury, School Chemical Clean Out Campaign, and close cooperation with state agencies engaged in school/child care siting, construction, and renovation.
- Toxics reduction grants to reduce legacy toxics stored in or embedded in schools/child care facilities should be offered to state environment agencies, advised by education agencies

- Smaller national and regional grants should be targeted at educating schools/child care operators on 1- legacy toxics in facilities and or in storage, and 2- advancing with the states and national NGOs model green procurement policies and opportunities
- OCSPP should have staff and contractual resources sufficient to ensure the partnership succeeds and grants are managed effectively.

ORD- Office of Research and Development $10 Million

- *America's Children and the Environment (ACE)*, a report produced periodically by OCHP has noted the need for more indicator data on children's exposures, while others have urged studies on pre- and post- facility renovation assessments of children's health and learning, or studies on children's health in tandem with NIOSH's Health Hazard Evaluation program. These are complex, hard to organize studies that would benefit the field and help refine EPA and other agencies' goals and objectives.
- ORD should have staff and contractual resources sufficient to ensure the partnership succeeds and grants and managed effectively.

Coalition *for* Healthier Schools

...providing the national platform and the forum for environmental health at school, since 2001...

Coordinated by Healthy Schools Network

May 22, 2017 - *via email and hard copy*

Chairmen and Ranking Members
US Senate Environment and Public Works Committee
US Senate Appropriations Committee
House of Representatives Energy and Commerce Committee
House of Representatives Appropriations Committee

RE: FY 18 Appropriations to Educate Schools/Childcare on Health and Facilities

America's School Infrastructure earned a D+ this year from the American Society of Civil Engineers and a D in 2013. If this were your child, you would look for fresh help. In the case of school facilities, congress has the opportunity to invest in proven voluntary programs that prevent the neglect of infrastructure and prevent risks to children's health and learning.

Schools are the places where children spend most of their time when not at home: every school day there are some 55M children in 130,000 public and private schools, and another six million in child care. Decades of research have shown that indoor environmental exposures to pollutants can be more intense than outdoor exposures; that schools are largely unaware of how facility neglect impacts children; and that schools and childcare facilities are filled with asthma triggers such as dusts, molds, chemical fumes, pests and pesticides, other contaminants. Poor indoor environments in schools decrease seat time, attendance, and test scores, and increase asthma and other health events, and thus increase the nation's health costs for children and for personnel.

We urge congress to increase funding for US EPA's proven, voluntary programs that educate schools and childcare centers on how to manage their facilities to prevent and address common problems: Indoor Air pollution, dampness and molds, lead in drinking water, pests and pesticides, hazardous chemical storage, legacy toxics like PCBs, and more. The EPA programs also support public health services for children with suspected school-based environmental exposures.

US EPA, unique among the federal agencies, has a twenty-year history of successes in educating and convening PK-12 and childcare owner-operators and personnel, as well as NGOs and state and local health agencies. The lead offices are: 1- US EPA Office of Air and Radiation/Indoor Environments Division (Reducing Risks from Indoor Air) which, on a tiny budget, educated over 42,000 school and childcare stakeholders through guidelines, grants, annual symposia, and webinars; and, 2- EPA's Office of Children's Health Protection (OCHP) which partners with the National Institutes of Environmental Health Sciences on research and with the federal Centers for Disease Control and Prevention on pediatric environmental health services. Overall, the two primary EPA offices and other schools-focused programs at EPA help reduce exposures to children and personnel in school/childcare facilities, and help preserve educational facilities as valued community assets.

We urge an increase of $65 million to US EPA's budget over FY 16, as follows:

- $35M for EPA's Indoor Environments Division-Reducing the Risks of Indoor Air to advance healthy indoor environments in schools and child care centers with guidelines, grants to the field, annual symposia, webinars, and to provide federal leadership on school infrastructure concerns;

- $5M for EPA's Office of Children's Health to strengthen pediatric environmental health capacity to address children with suspected exposures in schools and child care settings;
- $10M for EPA's Office of Chemical Safety to strengthen its guidelines and enforcements that address legacy toxics in schools such as asbestos, lead, PCBs, and pesticides, and to encourage the safe management of hazardous chemicals in schools;
- $10M for EPA's Office of Research to strengthen and expand its research into children's exposures in the school/child care settings; and,
- $5M for EPA's Office of Water Quality to improve and disseminate guidance and grants address lead and other contaminants of drinking water in schools and child care facilities.

Sincerely,

Organizations

The Association of Asthma Educators (PA)
Association of School Business Officials International (ASBO)
Breast Cancer Prevention Partners
Californians for Pesticide Reform
Cancer Prevention Coalition for Los Angeles
Center for Environmental Health
Children's Environmental Health Network
Coalition for Environmentally Safe Schools (MA)
The Deirdre Imus Environmental Health Center(R) Hackensack UMC
Education Law Center
Empire State Consumer Project
First Focus
Green Schools National Network
Healthy Legacy (MN)
Health Promotion Consultants (VA)
Health Resources in Action
Healthy Schools Network
Improving Kids' Environment
IPM Institute of North America
Learning Disabilities Association of Georgia
Learning Disabilities Association of Illinois
Learning Disabilities Association of Maine
Learning Disabilities Association of New Jersey
Learning Disabilities Association of South Carolina
Learning Disabilities Association of Tennessee
Learning Disabilities Association of Utah
Maryland Children's Environmental Health Coalition
Midwest Pesticide Action Center
National Center for Environmental Health Strategies
Nontoxic Certified (NY)
PAN North America (CA)
Parents For Students Safety (TN)
Partners for a Healthier Community (MA)
Pennsylvania Integrated Pest Management Program
Pioneer Valley Asthma Coalition (MA)
Project Green Schools (MA)
Regional Asthma Management and Prevention (RAMP), (CA)
School-Based Health Alliance
School Based Health Alliance of Arkansas
South Texas Asthma Coalition

Toxics Information Project (TIP) (RI)
Valley Community Healthcare (CA)

Individuals (Organizational affiliations for information purposes only)

Gary Arthur, Issaquah Education Association
Carl R. Baum, MD, FAAP, FACMT, Yale School of Medicine
Augusta Gross Ph.D. (NY)
Kate Hewett (SC)
Jerry Lamping (TX), Take Care of Your Classroom Air
Larry K. Lowry, Southwest Center for Pediatric Environmental Health
Daniel Lefkowitz (NY)
Virginia Mott (ME)
Christina Olbrantz, Columbia University
Larry K. Olsen, Dr.P.H., MCHES, A.T. Still University
Joseph Ponessa Ph. D., Rutgers University
Chelsea Alexandra Schafer, California State University, Northridge*
Alexandra W. Sipiora (IL)
Mariana Torchia (CA)

CONTACT: Claire L. Barnett, Coordinator, Coalition for Healthier Schools and Executive Director, Healthy Schools Network, cbarnett@healthyschools.org, (m) 202 -543-7555

SCHOOL-BASED HEALTH ALLIANCE
Redefining Health for Kids and Teens

American SCHOOL HEALTH Association
Connecting Health & Learning

COLLABORATIVE FOR HIGH PERFORMANCE SCHOOLS.

NASN
National Association of School Nurses

ASSOCIATION OF SCHOOL BUSINESS OFFICIALS INTERNATIONAL

Healthy Schools Network

CHILDREN'S ENVIRONMENTAL HEALTH NETWORK

The Deirdre Imus Environmental Health Center®
HackensackUMC
CELEBRATING 15 YEARS PROTECTING CHILDREN'S HEALTH & THE ENVIRONMENT
IMUSENVIRONMENTALHEALTH.ORG

CALL FOR CHILDREN'S INITIATIVE: SCHOOL INFRASTRUCTURE AND ENVIRONMENTAL HEALTH

Caring for Our Future – 61 Million Children in School and Child Care

February 2017

Federal Children's Initiative: Environmental Health at School will recognize children's unique vulnerability to environmental health hazards, reduce environmental risks in crumbling and badly maintained PK-12 schools, generate benefits for all children, save taxpayer money, and provide local jobs in thousands of communities across the country.

The Initiative addresses INFRASTRUCTURE and CHILDREN'S HEALTH

1. Fund Facility Infrastructure and Transportation: Any federal infrastructure bill must address the dire need for environmental improvements to existing public PK-12 schools and child care facilities, resulting in buildings which are built, renovated, and operated to promote children's health and learning, and to be resilient to severe storms. Targeted actions and investments, with a priority on low-wealth schools, must address eliminating lead, asbestos, radon, and PCBs; reducing indoor dampness; conducting energy retrofits for heating, ventilation, and lighting systems; and ensuring less polluting school vehicles and safe routes to school.

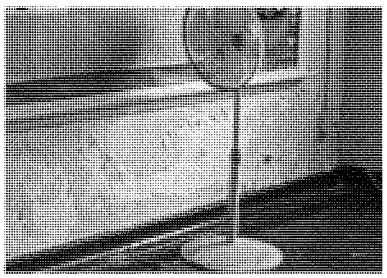
2. Establish Public Health Services for Children at Risk or with Environmental Exposures: Federal-state environmental health services to help children at risk or with exposures in schools/child care can be achieved by scaling up existing voluntary CDC, EPA, and NIEHS programs, research, and grants. These can provide public health services (tracking, interventions, reporting, and education) of children in partnership with city and state health agencies and with pediatric environmental health experts nationwide.

The Federal Initiative should be led by HHS/CDC and EPA, advised by ED, and an appointed advisory committee composed of representatives of children's environmental health, child health, school facility, and environment NGOs, parents, and education leaders. Federal leaders must include CDC's National Center for Environmental Health/Agency for Toxic Substances and Disease Registry and NIOSH; EPA's Indoor Environments Division and its Office of Children's Health; and Transportation's Safe Routes to School, as well as appropriate child care offices. The Children's Initiative must include funds for convening annual symposia attended by schools, agencies, advisers, and grantees, and funding for the Education Facilities Clearinghouse.

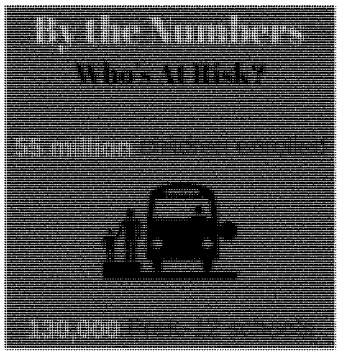
Providence (RI) Journal, 2015

Cedar Rapids, LA, KCRG/New, 2015

J Roseman, H&S Consultant to AFT

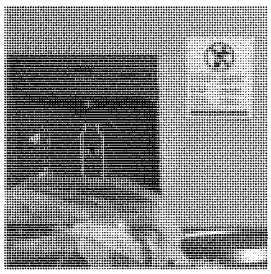


Evidence: Healthy learning places help children learn and stay healthy. Public health is what society does to ensure the conditions for people to be healthy. There are increasing numbers of high-risk learners who are poor or minority children—or have asthma, other chronic illnesses, or special learning issues—in schools and in child care, facing hazards common in schools, such as lead, pesticides, and poor indoor air in dark, dirty, damp buildings.
US EPA: Good ventilation reduces absences, improves staff productivity, and boosts test scores, such as 14-15% higher scores on standardized tests than in other classrooms, see http://tinyurl.com/hsuov4l.
National Research Council: Schools that are clean, dry, and quiet; control dusts and particulates; and have good indoor air promote attendance and achievement, see http://tinyurl.com/zmamzmb.
IOM: There is sufficient evidence to prevent environmental exposures in indoor environments, see http://tinyurl.com/j5kzuhe.



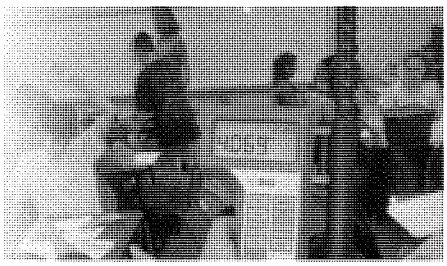
John Musso, Executive Director
Association of School Business Officials International (ASBO)
Reston, VA
"ASBO International urges Congress to launch an initiative that funds school infrastructure projects and promotes healthy learning environments for all students. We encourage the initiative to have an advisory committee that includes all K–12 stakeholders at the table, including school business officials, to ensure school districts have the sufficient funding and support they need to make this initiative a success."

Jerome Paulson, MD, FAAP, Professor Emeritus of Pediatrics and Environmental and Occupational Health, George Washington University School of Medicine and Health Sciences and Milken Institute School of Public Health*, Washington, DC
"Environmental health threats in child care centers and in PK-12 schools compromise children's health and learning, yet there is no federal, state, or local agency that is funded and staffed to protect children in these settings from environmental health hazards."



Portland, OR: water fountain closed due to lead, 2016, photo by parent

EPA/5: school chemical storage hazards



Carbon dioxide in classroom: adult critical thinking declines at 1,000 ppm CO2

Background on Recommendations: The reports below, collaboratively developed by scores of state and national NGOs, recommend ripe opportunities to scale up existing agency programs to deliver effective infrastructure and public health programs benefiting children's health and ability to learn.

- *Towards Healthy Schools: Reducing Risks to Children*, the 4th triennial national report from Healthy Schools Network, profiles successes and challenges in the states and finds all children at risk of exposures, see http://tinyurl.com/hn4g84b.
- *Blueprint for Protecting Children's Environmental Health: An Urgent Call to Action*, from the Children's Environmental Health Network, calls for children-first in all policy making, see http://tinyurl.com/hpzzyft.
- *Environmental Health at School* conferences in 2015-16, led by Healthy Schools Network, engaged 76 senior staff from CDC, EPA, NIOSH, pediatric environmental health experts, and advocates from 46 different organizations, see http://tinyurl.com/jozgrot.
- *Reducing Environmental Exposures in Child Care*, Environmental Law Institute, 2011, see http://tinyurl.com/zg5y9es.

Information contact: info at healthyschools dot org

ADDITIONAL STATEMENTS OF SUPPORT

*Organizational affiliations given for information purposes only.

Claire L. Barnett, MBA, Executive Director, Healthy Schools Network, Albany, NY
"What adult would not want a clean, dry, and quiet workplace with good indoor air and lighting? Unfortunately, too many schools have ignored these factors, then everyone suffers - the children, the taxpayers, the staff, and the facility as a community asset. We need a real priority on children."

Judy Braiman, President, Empire State Consumer Project, Rochester, NY
"We do not want any existing protections taken away. Children need to be educated in a safe and healthy environment."

Stacey Chacker, Asthma Regional Council of New England, Boston, MA
"Asthma is a leading chronic illness among children and teens in the U.S., and is a major reason why kids miss school. Chronic absenteeism contributes to delays in learning – such as not reading at grade level by the third grade, which in turn is an indicator for long-term health. Our schools – particularly those in our urban communities – need investments in their infrastructure to make them healthy places to learn and to prosper for all our nation's children. We urge our President-elect to invest in America's future – our youth!"

Sally Darney, MAT, PhD, Cary, NC
"As a parent and life-long health scientist I support these recommendations for optimizing healthy environments for children as we undertake infrastructure improvements."

Dr. David Dyjack, Executive Director, National Environmental Health Association, Denver, CO
"Environmental Health Professionals work hard every day to make the air we breathe, the water we drink, the food we eat and the homes we live in safe and secure."

Margaret Frericks, Improving Kids' Environments, Indianapolis, IN
"Indiana has a new law: schools must prevent idling, limit asthma triggers, and repair water damages. The state health agency can also investigate"

Julie Gast, PhD, Utah State University*, Logan, UT
"As the chair of the School Health Education and Services section of the American Public Health Association, I support funding to ensure schools are creating healthy and safe schools for our youth."

Katie A Gallagher, University of Massachusetts*, Holyoke, MA
"The cleanliness and health of a facility has a direct impact on student learning. Support environmental health strategies like no idling laws, working HVAC systems, and updated drinking water plumbing for public school facilities and directly impact the future of our youth."

Deirdre Imus, President & Founder, The Deirdre Imus Environmental Health Center®, Hackensack-Meridian, Hackensack, NJ
"Schools should be safe, nurturing environments that foster health and well-being - not threaten it. Reducing chemical exposures in schools is long overdue, and will not only improve academic performance, but will help kids feel better in and out of the classroom, now and in the future."

Shelley Kramer, Cancer Prevention Coalition for Los Angeles, Los Angeles, CA
"I have been involved with healthy schools, healthy products and information for consumers on avoidable risks of illness and cancer from environmental toxins for the past 23 years. I support this initiative."

Daniela Kunz, Parents For Student Safety, Franklin, TN
"There must be requirements and a national standard for safer, healthier schools…."

Jerry Lamping, Take Care of Your Classroom Air (TCYCA), Boerne, TX
"Clean Air is required in factories for the making of computers, electronics, drugs, food and beverages. Clean air must also be required in classrooms for the development of young human beings. Unclean air affects lungs, hearts, the nervous system, blood vessels and brains especially during their development."

Kathleen McCabe, Health Resources in Action, Boston, MA / Tamaki West, Massachusetts Asthma Action Partnership, Boston, MA
"Uncontrolled asthma can result in school absenteeism and missed work for a parent of a child with asthma. Asthma is the leading cause of school absenteeism nationwide. In Massachusetts more than one in three children with current asthma missed school or daycare because of their asthma at least once a year. We call on the President-elect to invest in the infrastructure of our nation's public schools, as well as scaling up existing federal programs that are proven to work."

Robin Organ, Executive Director, Green Schools, Mansfield, MA/National
"Help us develop the next generation of environmental leaders who understand the importance of having healthy bodies, a healthy environment, and a healthy and robust workforce. We thank you for championing such a vital cause, and are happy to support you in this endeavor and others around protecting our children and our future."

Jerome Paulson, MD, FAAP, Professor Emeritus of Pediatrics and Environmental and Occupational Health, George Washington University School of Medicine and Health Sciences and Milken Institute School of Public Health*, Washington, DC
"Environmental health threats in child care centers and in PK-12 schools compromise children's health and learning, yet there is no federal, state, or local agency that is funded and staffed to protect children in these settings from environmental health hazards."

Leslie Rubin, MD, Developmental Pediatric Specialists, Atlanta, Georgia
"Improving the health of children through preventing exposure to adverse environmental factors improves their chances to be healthy successful adults and to contribute positively to society - as a corollary failure to do so will inevitably increase the costs to society in the future..."

John Schlitt, School Based Health Alliance, Washington, DC
"How can we expect our children to thrive in sick schools? We can do better to systematically remedy the toxic environments where young people learn, play, and grow."

Anne Turner-Henson, PhD, RN, FAAN, UAB School of Nursing*, Birmingham, AL
"Frederick Douglas stated it is easier to build strong children than repair broken men. For U.S. schools to be GREAT, we need school environments with healthy indoor air quality, dry buildings, free from toxic chemicals, thermal comfort, clean, quiet and well maintained environments. Healthy school environments promote quality education and support learning."

ORGANIZATIONS

21st Century School Fund, Washington, D.C.

Advocates for Children of New York, New York, NY

American School Health Association, McLean, VA

Association of School Business Officials International (ASBO), Reston, VA

Asthma and Allergy Foundation of America, Landover, MD

Asthma Regional Council of New England, Boston, MA

Breast Cancer Fund, San Francisco, CA

Cancer Prevention Coalition for Los Angeles, Los Angeles, CA

Child Care Aware of America, Arlington, VA

Children's Environmental Health Network, Washington, D.C.

Collaborative for High Performance Schools, Sacramento, CA

Council of State and Territorial Epidemiologists, Atlanta, GA

Connecticut Foundation for Environmentally Safe Schools (ConnFESS), Newtown, CT

The Deirdre Imus Environmental Health Center, Hackensack University Medical Center, Hackensack, NJ

Empire State Consumer Project, Rochester, NY

Green Schools, Mansfield, MA/National

Health Resources in Action, Boston, MA

Healthy Schools Network, Albany, NY/ National

Institute for Health and the Environment, University at Albany, Albany, NY

Issaquah Education Association, Issaquah, WA

Learning Disabilities Association of Illinois, Palos Hills, IL

Learning Disabilities Association of Maine, Windham, ME

Learning Disabilities Association of South Carolina, Irmo, SC

Learning Disability Association of Tennessee, Memphis, TN

Maryland Children's Environmental Health Coalition, Glenwood, MD

Massachusetts Asthma Action Partnership, Boston, MA

Massachusetts Coalition for Occupational Safety and Health, Boston, MA

National Association of School Nurses, Silver Spring, MD

National Environmental Health Association, Joanne Zurcher, Washington, D.C.

Natural Resources Defense Council, Washington, D.C.

NEA Healthy Schools Caucus, Salem, OR

Parents For Students Safety, Franklin, TN

School Based Health Alliance, Washington, D.C.

Society for Public Health Education, Washington, D.C.

Take Care of Your Classroom Air (TCYCA), Bernie, TX

Women for a Healthy Environment: Healthy Schools PA, Pittsburgh, PA

INDIVIDUALS

*Organizational affiliations given for information purposes only.

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Jeff Vincent, PhD., Deputy Director, Center for Cities + Schools*, University of California, Berkeley, CA

Dr. Leon F. Vinci, Roanoke, VA

Kimberly S. Voss, Tulsa, OK

Ronald White, M.S.T., Environmental Health Consultant, Washington, D.C.

Yolanda Whyte, MD, Dr. Whyte Pediatrics Atlanta, GA

ADDITIONAL SUPPORT – 2017

*Organizational affiliations given for information purposes only.

Martha Engelke, East Carolina University College of Nursing*, Greenville, NC
"Children are our future and they can't learn if they are in a toxic environment. Health issues are a major barrier to good education."

Maryjane Puffer, The Los Angeles Trust for Children's Health, Los Angeles, CA
"Through our work with Los Angeles' school based health centers, we know that many of our children, the most vulnerable children, are exposed to environmental insults that exacerbate their fragile health conditions. On behalf of The Los Angeles Trust for Children's Health, I urge you to support our efforts to make every child healthy and able to succeed in school."

ORGANIZATIONS

Alameda County Early Care and Education Program, Oakland, CA

California School-Based Health Alliance, Oakland, CA

Children's Hospital of Wisconsin, Milwaukee, WI

Education Law Center, Newark, NJ

Green School National Network, Madison, WI

Improving Kids' Environments, Indianapolis, IN

Informed Green Solutions, East Burke, VT

The Los Angeles Trust for Children's Health, Los Angeles, CA

Midwest Pesticide Action Center, Chicago, IL

Pioneer Valley Asthma Coalition, Springfield, MA

School Based Health Alliance of Arkansas, Little Rock, AR

School Health Program at Children's Hospital of Wisconsin, Milwaukee, WI

Smackover-Norphlet School Based Health Center, Smackover, AR

Youth Bridge, Inc., Fayetteville, AR

INDIVIDUALS

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Jennifer Banas, *Northeastern Illinois University**, Chicago, IL

Jane Bradley, Creative Advertising and Publishing Services*, West Hartford, CT

Melissa Cowell, Green Schools*, Mansfield, MA/National

Valerie Davenport, Yellville-Summit School District*, Yellville, AR

Martha Engelke, East Carolina University College of Nursing*, Greenville, NC

Gabrielle Ettlinger, LA County DPH* Los Angeles, CA

Irena Gorski, Johns Hopkins Bloomberg School of Public Health*, Baltimore, MD

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Krystal Henagan, Helotes, TX

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Ann Loree, Littleton, MA

Debbie McAdams, El Dorado School Based Health Center*, El Dorado, AR

Mary Miller, Springdale Public Schools* Springdale, AR

Emerald S. Mills, Children's Hospital of Wisconsin, Milwaukee, WI

Virginia Mott, Maine PTA, Lakeville, ME

Christina Olbrantz, Columbia University*, New York, NY

Sonda Oppewal, UNC Chapel Hill School of Nursing*, Chapel Hill, NC

Marsha Presley, A.T. Still University*, Tempe, AZ

Chelsea Alexandra Schafer, CSUN Institute of Community Health & Wellbeing*, Los Angeles, CA

Suzanne Sellman, School-Based Health Alliance*, Washington, DC

Catherine Faye Williams, Arkansas School Based Health Alliance, Malvern, AR

Karma Williams, School Based Health Alliance, Lamar, AR

To: Jackson, Ryan[jackson.ryan@epa.gov]
From: danielle quist
Sent: Fri 7/21/2017 8:55:55 PM
Subject: Danielle Quist's LD2 reports
Danielle Quist 2015 LD2.pdf
Danielle Quist 2016 LD2.pdf

Ryan, thank you for meeting with me this afternoon and considering me for this unique position. I have attached sections of AFBF's LD2s for 2015 and 2016 where my name is listed as a lobbyist. I will send the 2017 reports to you on Monday.
The reports list multiple specific issues and lobbyists in each general issue area - but that does not mean I lobbied on each specific issue listed.

Kind regards,
Danielle Quist

To: Lyons, Troy[lyons.troy@epa.gov]; Greenwalt, Sarah[greenwalt.sarah@epa.gov]; Rees, Sarah[rees.sarah@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]; Benton, Donald[benton.donald@epa.gov]; Pruitt, Scott[Pruitt.Scott@epa.gov]; Schwab, Justin[schwab.justin@epa.gov]
Cc: 'John Hall'[jhall@hall-associates.com]
From: Telford Borough
Sent: Wed 6/7/2017 7:22:48 PM
Subject: Call to Action letter
Ex. 1 - Endpont Report - Follow up Analysis.pdf
Ex. 2 - EPA-SAB-Peer Review Rpt.pdf
Ex. 4 - Dodds Report.2006.pdf
Ex. 5 - SAB Lake Erie Peer Review.pdf
Letter to EPA Admin Pruitt - Peer Review of Nutrient Endpoint Document - 6-6-17.pdf
Transmittal Letter to PA Congressmen - 6-6-17.pdf
Ex. 3 - Everett Memo - PaDEP 2002.pdf

Dear Administrator Pruitt,

On behalf of the Southeastern Pennsylvania Nutrient Coalition, I submit a request for Peer Review of EPA Region 3's TMDL Nutrient Endpoint Report. We believe this EPA document creating stringent nutrient reduction requirements for Eastern PA waters is not scientifically defensible and will misallocate millions of dollars in municipal funds toward unnecessary construction of wastewater and stormwater facilities. These types of regulatory decisions should be peer reviewed. We have asked our Senators and Congressmen to address this very important issue with you and your office staff as well. Thank you for your consideration in this critical matter and I look forward to your favorable response.

Sincerely,

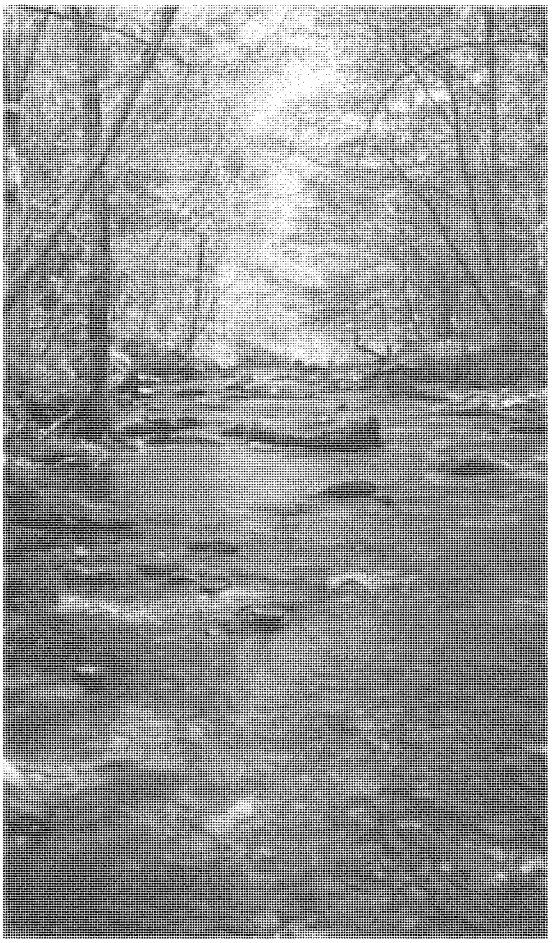
Mark D. Fournier

Borough Manager

Telford Borough, PA

Development of Nutrient Endpoints for the Northern Piedmont Ecoregion of Pennsylvania: TMDL Application

Follow-up Analysis



Prepared for

United States Environmental Protection Agency

Region 3

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18 July 2012

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1. INTRODUCTION

The United States Environmental Protection Agency (USEPA) in Region 3 continues to oversee the development of nutrient TMDLs to protect aquatic life use for several streams in the Northern Piedmont ecoregion of southeastern Pennsylvania. Tetra Tech, Inc (Tt) was contracted to establish appropriate and defensible TMDL endpoints for nutrients that protect aquatic life uses in this ecoregion. For that original work Tt developed TMDL endpoints using a multiple lines of evidence approach consistent with USEPA guidance (USEPA 2000a, 2000b) that included reference distribution based, stressor-response based, and scientific literature based evidentiary lines and which were reported to USEPA (Paul and Zheng 2007).

In 2010, USEPA published revised guidance for conducting stressor-response analyses in support of nutrient criteria derivation (USEPA 2010). In response to that revision, Tt was asked to conduct additional analyses in support of the original report and to recommend values associated with the additional analyses that may be considered with the original lines of evidence in revising the TP endpoints. It is important to note that this report does not replace the original analysis, but rather adds to it. In particular, no additional reference distribution based endpoints are being derived, and only one additional piece of scientific literature is being added that was published subsequent to the original report and may have relevance for this region. Lastly, results from a mechanistic model of Indian Creek targeting specific algal endpoints are being included in this report as an additional line of evidence.

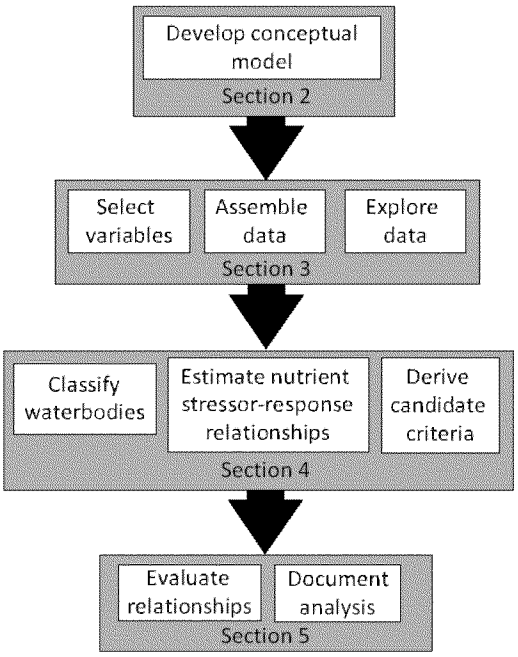

Figure 1- Steps in stressor-response analysis (USEPA 2010).

2. REVISED GUIDANCE

The revised guidance lays out a 4 step process (Figure 1) which was essentially followed in the original analysis: developing a conceptual model, assembling and exploring the data, analyzing the data to derive candidate criteria, and reviewing and documenting the analysis. This document begins with a discussion of the conceptual model in more detail following the 2010 guidance. It then skips the second step since no additional data were added and the data

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selection, assembly, and exploration, covered in the original document, remain unchanged. Step 3 is the principal focus of the document, explaining and reporting on the additional analyses conducted. This report satisfies step 4's element related to documenting the analysis.

Ultimately, the stressor-response modeling efforts are conducted to identify a nutrient threshold to protect Piedmont stream macroinvertebrates from nutrient impacts. It is preferable that this be done in a way that is not confounded by other stressors, which could result in errors in estimating a protective nutrient concentration, and the USEPA (2010) provided guidance to better achieve this goal. It is well known that certain sources, for example urbanization, produce a range of stressors, including, but not limited to, nutrients that can affect aquatic life in streams. The revised conceptual model effort in this report builds off the original conceptual model and attempts to identify other stressor pathways by which the response variable could be impacted by the dominant stressors sources in the watershed and ecoregion. This is done, in part, to help guide the consideration of other stressors for modeling so the unique effect of nutrients on responses relative to the other stressors could be better estimated. After identifying potential additional stressors with the conceptual model, their relationship to both nutrients and responses was estimated with correlation analysis. Multiple regressions were then conducted to compare the predictive strength of these different stressors and evaluate how significant nutrients remained. Finally, sites were classified into dominant stressor source classes to better isolate the unique effect of nutrients on the response and estimate a more appropriate and protective nutrient concentration for protecting aquatic life in Piedmont streams.

3. Conceptual Model

Nutrients affect aquatic systems in diverse ways, and the effects on most non-primary producer aquatic life uses are indirect. The original ecoregional TMDL analysis was based on a simplified conceptual model that was, nonetheless, used to "depict accepted scientific knowledge regarding the effects of nitrogen/phosphorus pollution in surface waters" (USEPA 2010) and thereby reinforce the presumptive causal relationship and guide the analysis (Figure 2).

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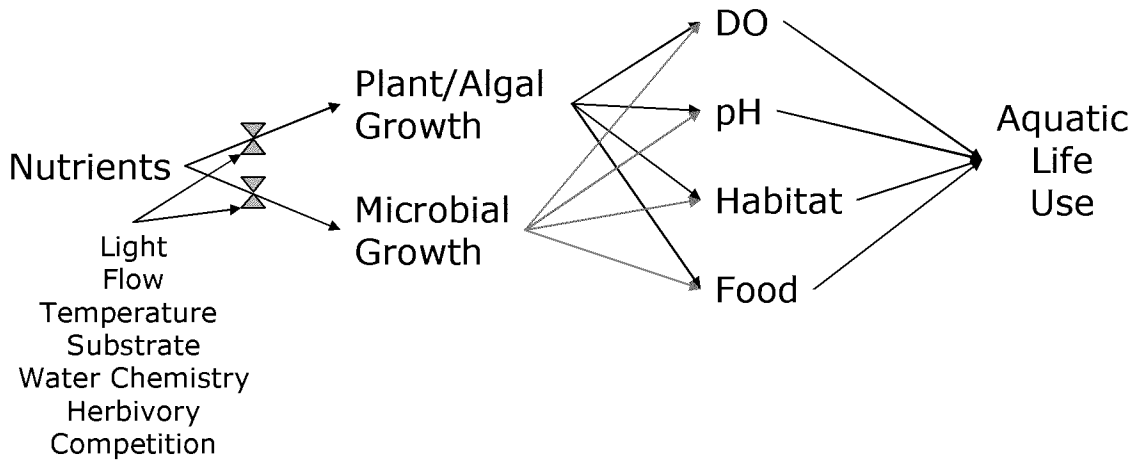

Figure 2 – Simplified diagram illustrating the causal pathway between nutrients and aquatic life use impacts (Paul and Zheng 2007).

The revised guidance provides a more detailed conceptual model that can be adapted for similar application (Figure 3). Blue boxes indicate primary elements relevant to the current analysis. Specifically detailed are the dominant urban point and non-point pollutant sources generating nutrient stressors (orange box), as well as stressors that co-occur with nutrients such as sediment, flow, and toxics arising from similar sources that may confound the stressor-response analyses. The model is consistent with the presumptive causal model presented earlier and the guidance reviews the substantial literature in support of the causal linkages (USEPA 2010). An essential insight from the causal model in Figure 3 is the identification of alternate potential stressors that co-vary with nutrients such as flow, sediment, and toxics data. If available, these should be evaluated for their potential to confound results. As explained above, these other variables have negative effects on macroinvertebrates, their co-occurrence with nutrient stressors could interfere with the nutrient response and this needs to be evaluated to the extent possible. Toxics data were not available within the ecoregional dataset, so conductivity was used as a surrogate for other dissolved pollutants. Also, habitat data were considered to control for the confounding effect of sediment and scouring on habitat mediated impacts on macroinvertebrates. The goal of subsequent analyses, therefore, was to consider and account for some of these covariate effects.

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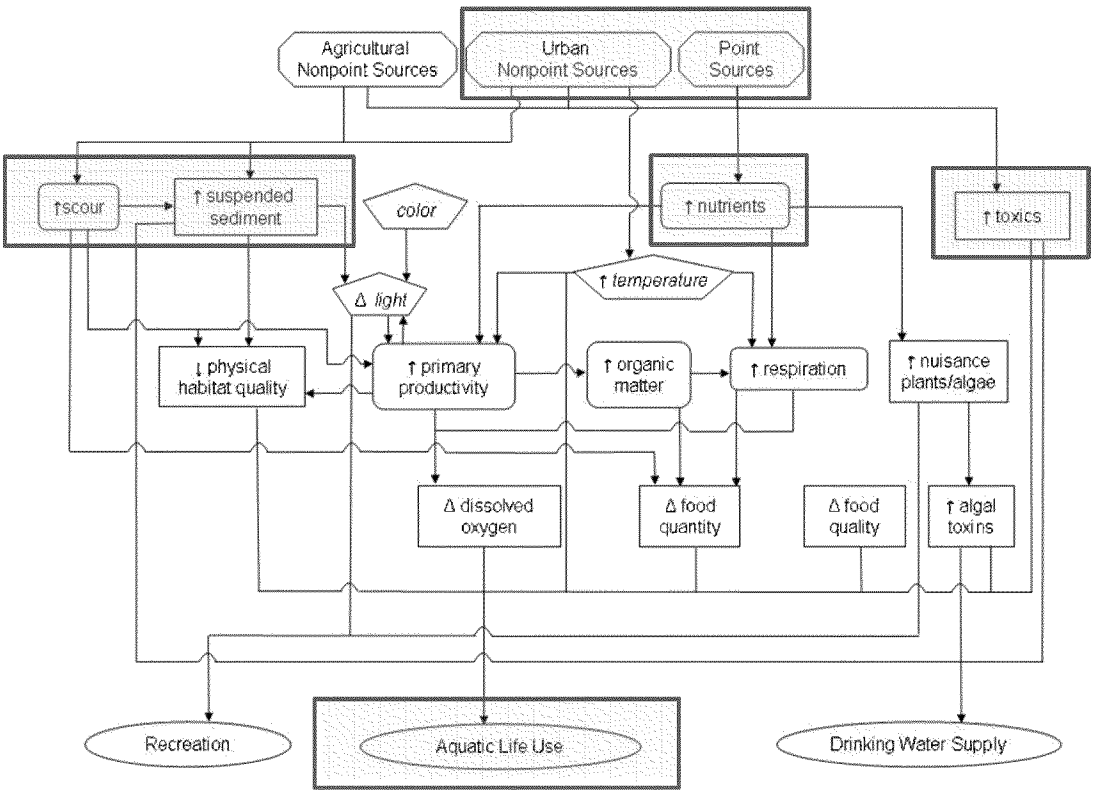

Figure 3 - More detailed conceptual model of the causal relationship between nutrients and responses in streams (after USEPA 2010)

In the original empirical models, biological metrics from the Maryland Biological Stream Survey (MBSS) piedmont index were used since this was the most substantial dataset available for the piedmont ecoregion (MDNR 2005). Since the goal of the analysis was to identify thresholds inimical to aquatic life, these data were appropriate. Also, absent specific numeric aquatic life use endpoints for these metrics in Pennsylvania, the middle of the MBSS index and component metric scoring ranges were used as response goals in the regression models, where such endpoints were needed. For example, the median of the Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa richness metric scoring range was 8 taxa (MDNR 2005), this is the midpoint between poor and good scores for this metric in the MBSS index and was used as the response target in the regression models below. Higher, more stringent targets could have been developed to assure greater likelihood of protection, but this value was defensible as a mid-range threshold. These middle values were also between the 10th and 50th percentile of MBSS piedmont reference site biological metric values, which is consistent with thresholds commonly used for defining biological targets and within the range ultimately proposed by Pennsylvania Department of Environmental Protection (PADEP) for their own evolving macroinvertebrate index (Barbour et al. 1999, PADEP 2009).

The metrics selected by MBSS for their piedmont ecoregion index include the number of taxa, number of EPT, the number of Ephemeroptera taxa, the percent of individuals of intolerant urban taxa, the percent of individuals that are chironomids, and the percent of

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individuals classified as clingers. The PADEP (2009) used similar metrics: number of taxa, number of EPT taxa, Beck's index, Shannon diversity, Hilsenhoff's biotic index, and the percent individuals from intolerant taxa.

4. Data Analysis – Correlations

The goal of this subsequent analysis was to evaluate the effects of confounding or covarying stressors on nutrients, to attempt to refine the analysis to account for those effects, and to document the results. One approach recommended in the revised USEPA guidance was to attempt to classify the data into bins or classes of similar covariate distributions to control for the effects of these covariates and isolate, as much as possible, the independent effect of nutrients. This was attempted in two ways: propensity scores and manual binning.

Propensity score analysis is explained in the guidance (USEPA 2010) and is an analytical approach that controls for the effects of covariates by using them to generate predicted nutrient concentrations, called propensity scores, whose predicted value is a function of the covariation. Propensity scores are then split into several bins, within which the approximate distribution of covariates is similar and the effects of nutrients can be independently evaluated. The first step in the analysis is identifying nutrient covariates. A correlation analysis between nutrients and other likely stressors was conducted. Data were standardized to the mean and standard deviation of all values and log-transformed as necessary beforehand to meet assumptions of constant variance for the correlation, multiple regression, and principal components analysis. Those analyses were performed using Statistica software. This standardization allowed for an equal comparison of variable effects independent of differences in magnitude and range, which helped these analyses. For the simple linear regression model to estimate TP endpoints, however,$\log_{10}$-transformed TP concentrations were used as in the original report.

Little or no correlation between nutrients and other stressors, both chemical and physical, was observed. Highest correlations with TN were with DO (positive), sulfate (negative), and flow (positive). With TP, the highest correlations were with turbidity (positive), sulfate (positive), embeddedness (positive), and epibenthic substrate habitat (negative). These results are consistent with a covarying effect of nutrients and sediment, but were insufficiently strong to recommend propensity score analysis.

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Table 1 - Correlation matrix among physical and chemical variables in the MBSS dataset used. Values highlighted in blue were significantly correlated (p<0.05 and r>|0.5|)

Spearman Rank Order Correlations												
Variable	Nitrate	Total Nitrogen	Total Phosphorus	Dissolved Oxygen	pH	Conductivity	Sulfate	Turbidity	Instream	EPI Substrate	Embedded	Flow
Nitrate		0.988	0.061	0.248	-0.099	-0.081	-0.236	-0.027	0.015	0.061	-0.080	0.130
Total Nitrogen	0.988		0.099	0.239	-0.109	-0.070	-0.220	-0.011	0.002	0.043	-0.077	0.142
Total Phosphorus	0.061	0.099		-0.059	0.051	0.120	0.269	0.283	-0.145	-0.194	0.231	0.128
Dissolved Oxygen	0.248	0.239	-0.059		-0.029	-0.130	-0.181	-0.234	0.209	0.293	-0.193	0.232
pH	-0.099	-0.109	0.051	-0.029		0.548	0.518	-0.141	0.162	0.049	0.115	0.274
Conductivity	-0.081	-0.070	0.120	-0.130	0.548		0.730	-0.065	-0.205	-0.255	0.263	-0.112
Sulfate	-0.236	-0.220	0.269	-0.181	0.518	0.730		0.001	-0.182	-0.236	0.213	-0.034
Turbidity	-0.027	-0.011	0.283	-0.234	-0.141	-0.065	0.001		-0.101	-0.156	0.163	0.138
Instream	0.015	0.002	-0.145	0.209	0.162	-0.205	-0.182	-0.101		0.808	-0.423	0.512
EPI Substrate	0.061	0.043	-0.194	0.293	0.049	-0.255	-0.236	-0.156	0.808		-0.571	0.339
Embedded	-0.080	-0.077	0.231	-0.193	0.115	0.263	0.213	0.163	-0.423	-0.571		-0.109
Flow	0.130	0.142	0.128	0.232	0.274	-0.112	-0.034	0.138	0.512	0.339	-0.109	
Correlations in blue are more than or less than 0.5												
Missing data is deleted pairwise												

Given the weak correlation between nutrients and other stressors, and essentially only weak covariation, it was decided that propensity score analysis was not necessary. However, correlations between biological responses and stressors other than nutrients were evident (Table 2). As a result, it was felt that it was still necessary to attempt to tease apart the effect of nutrients after controlling for other stressors. This was done in two different ways.

Table 2 - Correlation matrix between physical and chemical variables and the biological metrics that compose the MBSS Piedmont multimetric index. Values highlighted in red were significantly correlated.

Spearman Rank Order Correlations												
Variable	Nitrate	Total Nitrogen	Total Phosphorus	Dissolved Oxygen	pH	Conductivity	Sulfate	Turbidity	Instream	EPI Substrate	Embedded	Flow
Intolerant Urban %	0.137	0.104	-0.268	0.235	-0.393	-0.612	-0.522	-0.164	0.247	0.371	-0.345	-0.086
Chironomid %	-0.082	-0.058	0.147	-0.232	0.284	0.483	0.373	0.200	-0.231	-0.332	0.300	0.007
Clinger %	0.093	0.057	-0.183	0.242	-0.212	-0.448	-0.351	-0.218	0.327	0.412	-0.353	0.075
Total Taxa	0.242	0.225	0.022	0.058	-0.280	-0.389	-0.411	0.025	0.111	0.138	-0.077	0.051
EPT Taxa	0.270	0.239	-0.159	0.263	-0.286	-0.553	-0.492	-0.171	0.289	0.383	-0.328	0.089
Ephemeroptera Taxa	0.286	0.263	-0.107	0.257	-0.231	-0.569	-0.434	-0.061	0.240	0.302	-0.238	0.112
Correlations in red are significant at p <.05												
Missing data is deleted pairwise												

The first was through the use of multiple regression models to compare and explore the contributory effects of different stressors simultaneously and the second was through binning sites by urban intensity, which will be discussed in sections 5 and 6.

5. Data Analysis – Multiple Regression

Multiple linear regression (MLR) models were generated to predict invertebrate metric scores across MBSS piedmont sites using forward stepwise selection (F to enter = 4). This analysis was intended to compare stressor predictors and identify and support the basis for the independent effects of nutrients in this multi-stressor environment.

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Simple linear regression is a statistical method that generates a predictive empirical model that estimates the effect of a single predictor (e.g., nutrients) on a response variable (e.g., a benthic metric). Alternatively, one may believe that multiple predictors (e.g., sediment and nutrients) influence the response variable and one can construct a model that predicts the effect of many variables on the response simultaneously. In these multiple regression models, then, the resultant model identifies more than one predictor to estimate a response condition. Various statistical methods exist that guide selection of the order of predictors in a multiple regression model. For this expression, a forward stepwise procedure was used, which adds predictors to a model based on the significance of their effect on the response. The most significant effect is added first, then the model compares the significance of the remaining predictors and adds the one providing the second most significant prediction, and so on until no additional predictors that meet the significance requirement for entry in the model are identified. The result is a multiple predictor model that predicts the responses. Multiple regression modeling allows one to compare the significance of different predictors, but it was also used here to verify the continued significance of nutrient predictors after accounting for other stressors on macroinvertebrates, which was important in continuing to argue for the importance of nutrients to invertebrate responses. For the intolerant percent urban individual taxa metric, MLR models still included TP as a significant negative predictor in the model (Tables 3 and 4); in fact, TP was the second most predictive variable after conductivity. Conductivity is a frequent stressor associated with urbanization and was highly correlated with pH. Other predictors included turbidity, flow, and habitat conditions, but the latter all explained less additional variance than TP.

The other metric for which TP entered an MLR as a significant predictor was for Ephemeroptera taxa (Tables 5 and 6). In this case, TP explained less variance than for intolerant percent urban taxa, but TP had a significant negative effect on the model prediction.

These results strengthen the argument for an independent effect of TP on macroinvertebrate taxa in Piedmont streams that is consistent with the causal conceptual model presented in the original report and the updated model presented above. There are several variables that contribute to predicting invertebrate declines in the Piedmont, but TP is defensibly one of them. The next analysis attempts to develop TP thresholds while controlling for these other stressors and focused specifically on urban effects and binning sites by urban intensity.

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Table 3 - MLR model summary of stepwise regression for the intolerant percent urban invertebrate metric.

Regression Summary for the Dependent Variable of Irtolerant Urban %						
	b*	Standard Error of b*	b	Standard Error of b	t(330)	p-value
Intercept			27.139	1.912	14.195	0.00000
Conductivity	-0.499	0.049	-14.854	1.459	-10.182	0.00000
Total Phosphorus	-0.139	0.043	-4.251	1.308	-3.249	0.00128
Turbidity	-0.157	0.042	-4.637	1.255	-3.694	0.00026
Flow	-0.198	0.047	-10.666	2.500	-4.266	0.00003
EPI Substrate	0.221	0.047	6.604	1.404	4.702	0.00000
pH	-0.101	0.049	-3.026	1.477	-2.049	0.04123
R= .69996489 R^2= .48995084 Adjusted R^2= .4806772						
F(6,330)=52.833 p<0.0000 Standard Error of estimate: 21.445						
N=337						

Table 4 - MLR model summary of stepwise addition for the intolerant percent urban invertebrate metric.

Summary of Stepwise Regression of Intolerant Urban%							
Variable	Step	Multiple R	Multiple R-square	R-square change	F - to remove	p-value	Variables
Conductivity	1	0.576	0.332	0.332	166.171	0.00000	1
Total Phosphorus	2	0.631	0.398	0.066	36.785	0.00000	2
Turbidity	3	0.656	0.430	0.032	18.633	0.00002	3
Flow	4	0.672	0.451	0.021	12.914	0.00038	4
EPI Substrate	5	0.695	0.483	0.032	20.713	0.00001	5
pH	6	0.700	0.490	0.006	4.199	0.04123	6

Table 5 - MLR model summary of stepwise regression for the Ephemeroptera taxa invertebrate metric.

Regression Summary for the Dependent Variable Ephemeroptera Taxa						
	b*	Standard Error of b*	b	Standard Error of b	t(332)	p-value
Intercept			2.779	0.102	27.201	0.00000
Conductivity	-0.531	0.043	-1.261	0.103	-12.232	0.00000
Total Nitrogen	0.206	0.044	0.508	0.109	4.650	0.00000
Dissolved Oxygen	0.112	0.044	0.279	0.110	2.536	0.01166
Total Phosphorus	-0.090	0.044	-0.220	0.107	-2.063	0.03985
R= .62131600 R^2= .38603357 Adjusted R^2= .37863639						
F(4,332)=52.187 p<0.0000 Std.Error of estimate: 1.8712						
N=337						

Table 6 - MLR model summary of stepwise addition for the Ephemeroptera taxa invertebrate metric.

Summary of Stepwise Regression of Ephemeroptera Taxa							
Variable	Step	Multiple R	Multiple R-square	R-square change	F - to remove	p-value	Variables
Conductivity	1.000	0.565	0.319	0.319	156.770	0.00000	1.000
Total Nitrogen	2.000	0.604	0.365	0.046	24.038	0.00000	2.000
Dissolved Oxygen	3.000	0.615	0.378	0.014	7.302	0.00724	3.000
Total Phosphorus	4.000	0.621	0.386	0.008	4.258	0.03985	4.000

6. DATA ANALYSIS – REGRESSION WITHIN BINS

There was substantial evidence that, in this ecoregion, urbanization was associated with several stressors including nutrients and TP, consistent with the conceptual model. This is likely due to both point and non-point TP sources that have been demonstrated to deliver this particular pollutant. The conceptual model identifies some of these – namely flow alteration, sediment, and other toxics. Fortunately, variables related to these stressors were available and many were used in the MLR demonstration above to verify the independent significant effect of nutrients in the presence of these multiple stressors.

The ultimate goal of this analysis was to strengthen the defensibility of TP threshold concentrations developed to protect aquatic life in Piedmont streams for the purposes of TMDL modeling. A concern, indicated above, was that other stressors may be confounding the ability to identify the most defensible endpoints. One element that became clear during the analysis was that urbanization may actually be responsible for several stressors that co-occur with nutrients, likely impact invertebrates as well as nutrients, but may be confounding the ability to create the clearest model of nutrient response for the purposes of developing a TP target to protect aquatic life. Conceptually, if the impact of these urban stressors could be isolated and/or reduced, then a clearer model of nutrient response could be developed and TP thresholds identified for the target aquatic life use endpoints when these cofounding effects were minimized. Such approaches are recommended in the new stressor-response guidance (USEPA 2010). Therefore, an attempt was made to identify the urban effect and focus on identifying a gradient minimally impacted by these co-occurring urban stressors. The first step was to identify the urban gradient and this was addressed with principal component analysis.

A principal components analysis (PCA) was used to construct a model that created a predominantly urban gradient (Figure 4). PCA is a multivariate analysis that reduces the variance among multiple factors into a few dimensions associated with the dominant gradients. Only the first principal component was used since it represented the majority of the variance (59%) and was associated with urbanization (e.g., imperviousness, conductivity, development, and flashiness). Given the orthogonal effect of the habitat metric to urbanization, it was removed, and a second PCA was conducted to construct the

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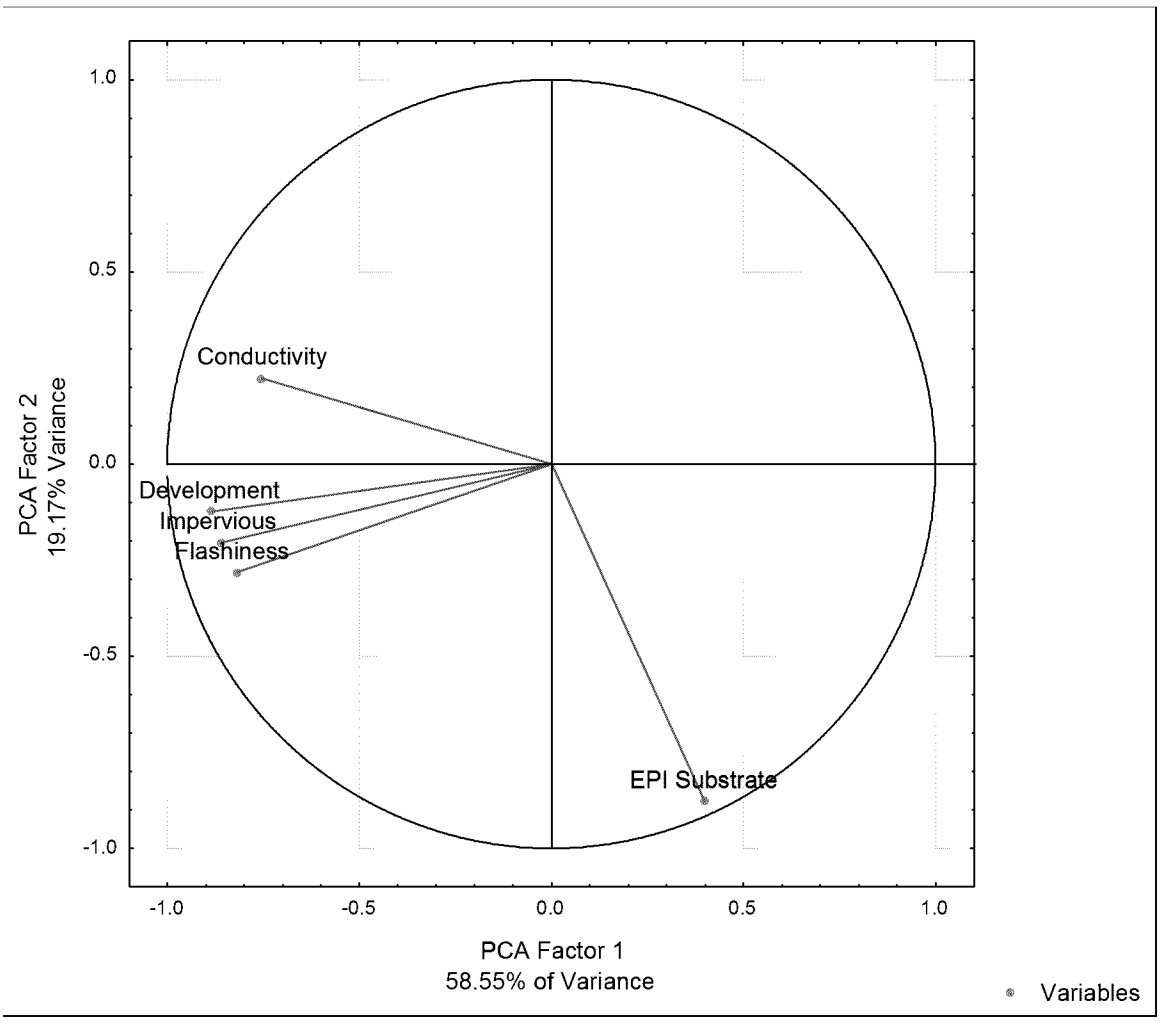
final urban gradient, the first axis of this second PCA explained 70% of the variability in the



data (Figure 5).

Figure 4 – Plot of first two principal components generated indicating axis 1 was associated with the principal urban factors related to water chemistry (conductivity), flow alteration, and overall urbanization (LDI scores and Imperviousness). Habitat condition was predominantly orthogonal to the principal urban stressors. The percent value indicates how much of the variance in the data is explained by each axis.

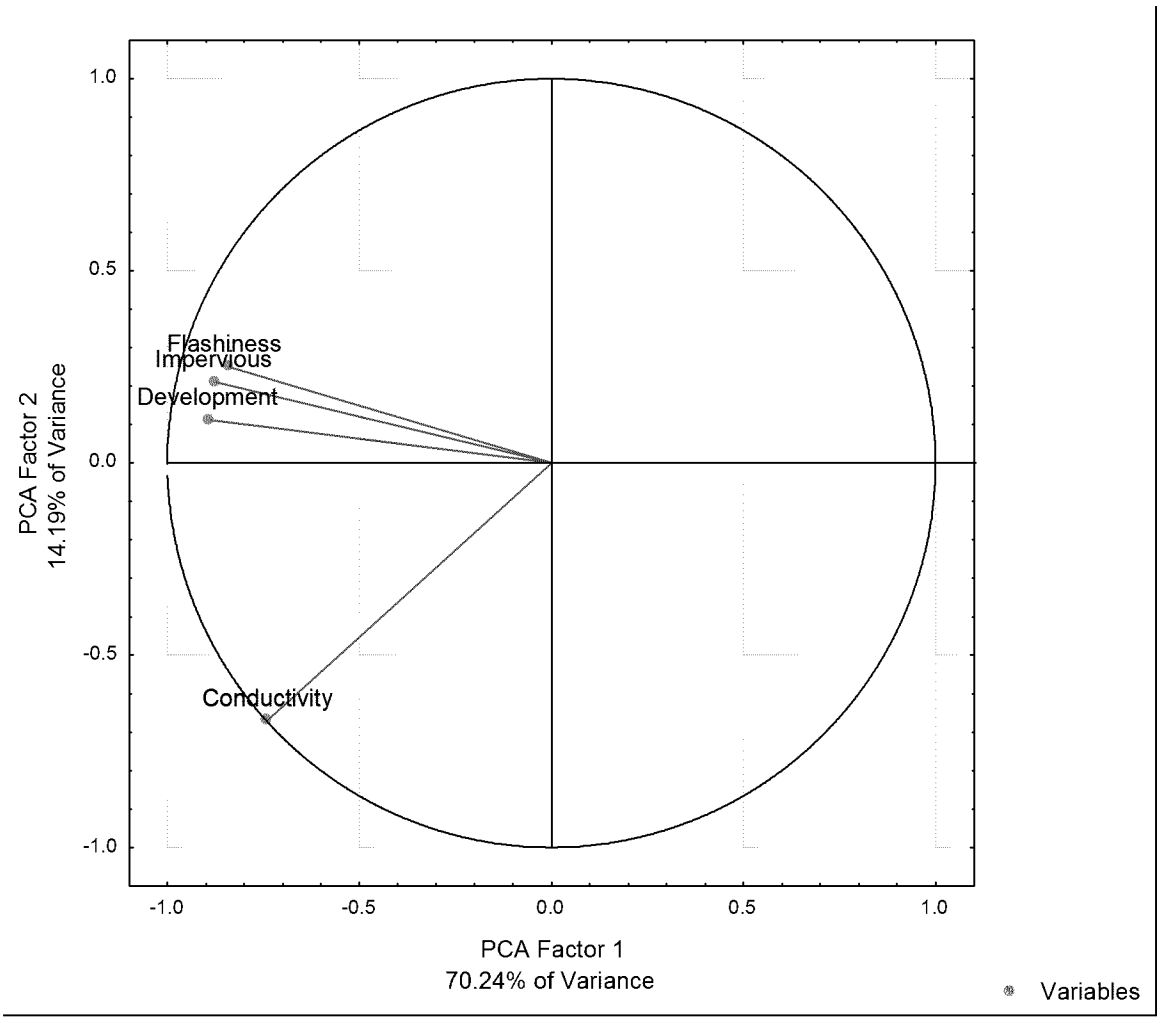


Figure 5 – Plot of first two principal components generated from second PCA indicating axis 1 was again associated with the principal urban factors related to water chemistry (conductivity), flow alteration, and overall urbanization (LDI scores and Imperviousness).

The first axis of the second PCA was split into 3 equal sized bins from group 1 (highest third of principal component axis 1 values, least urban) to group 3 (lowest third of principal component axis 1 values, most urban). Total phosphorus concentrations overlapped across the three groups, but central tendencies were highest for groups 2 and 3 (Figure 6). The bin groups were used to color-code the sites in plots of TP versus EPT taxa richness and percent intolerant urban taxa, two of the metrics more strongly related to TP.

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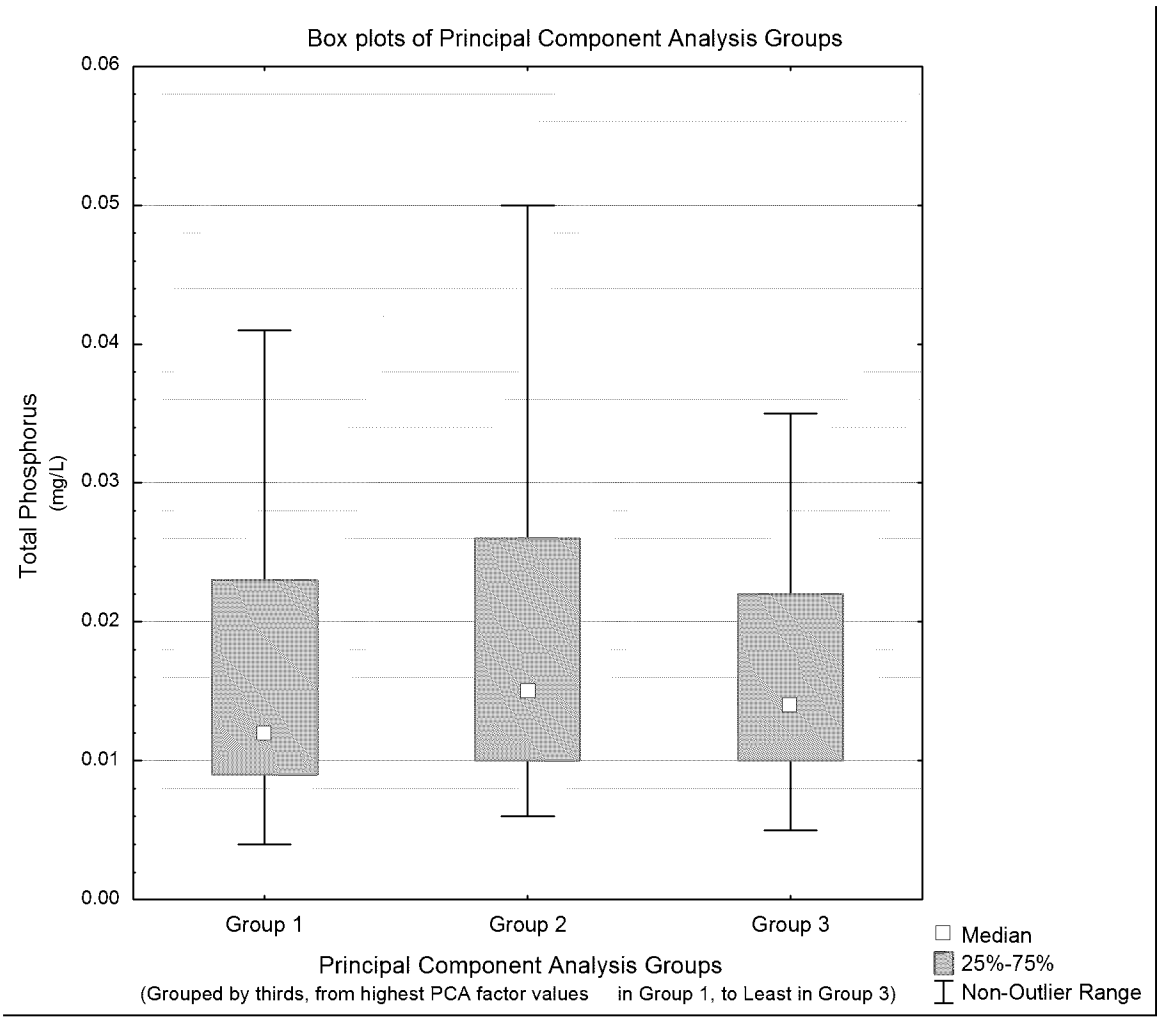

Figure 6 – Box and whisker plot of TP concentrations (mg/L) across the three principal component groups.

The resultant figure (Figure 7) indicates that group 3 sites (most urban) were frequently associated with sites scoring low for EPT taxa richness when TP concentrations were low. This group represents a large confounding effect on the EPT vs. nutrient relationship for Piedmont streams because these sites have generally low TP and low EPT richness, so are presumably primarily impacted by other stressors than nutrients. This analysis allowed us to isolate the conflicting effects of the urban stressors and focus more specifically where TP effects were strongest in order to better identify a protective TP threshold estimate for this region. Simple linear regression interpolative models (Figure 8), as recommended in the revised guidance (USEPA 2010), were then used to infer protective concentrations of TP associated with the adverse response condition for this metric (8 EPT taxa) with the confounding group 1 sites removed, and it can be seen that the nutrient response was even stronger (steeper slope and increased regression coefficient than the original models). The range in TP concentrations associated with the interpolation of EPT taxa richness of 8 taxa

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with the lower 50th percentile prediction interval, a conservative prediction interval estimate, and the average predicted value was 10 to 85 µg/L. Groups 1 and 2 also produced independent linear models that were significant. The group 2 model was the most precise ($r^2 = 0.16$) and the predicted TP values associated with the EPT taxa richness endpoints for the lower quartile and average predictions ranged from 10 to 60 µg/L.

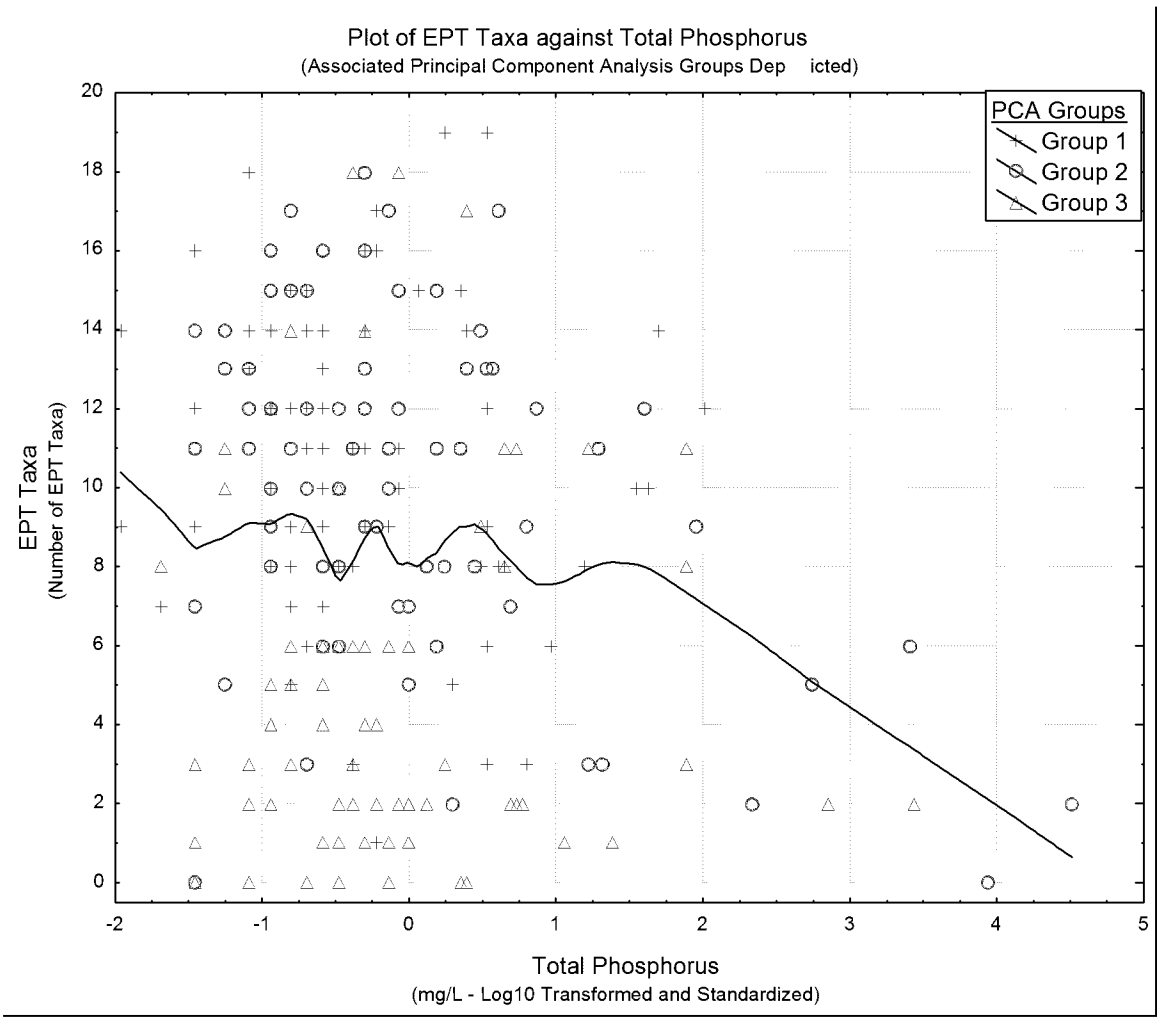

Figure 7 – Scatterplot of standardized TP concentration versus EPT taxa richness for MBSS piedmont sites. red triangles are group 3 (most urban), blue circles group 2, and black crosses group 1 (least urban). Black line is a loess smoothed fit through all the data.

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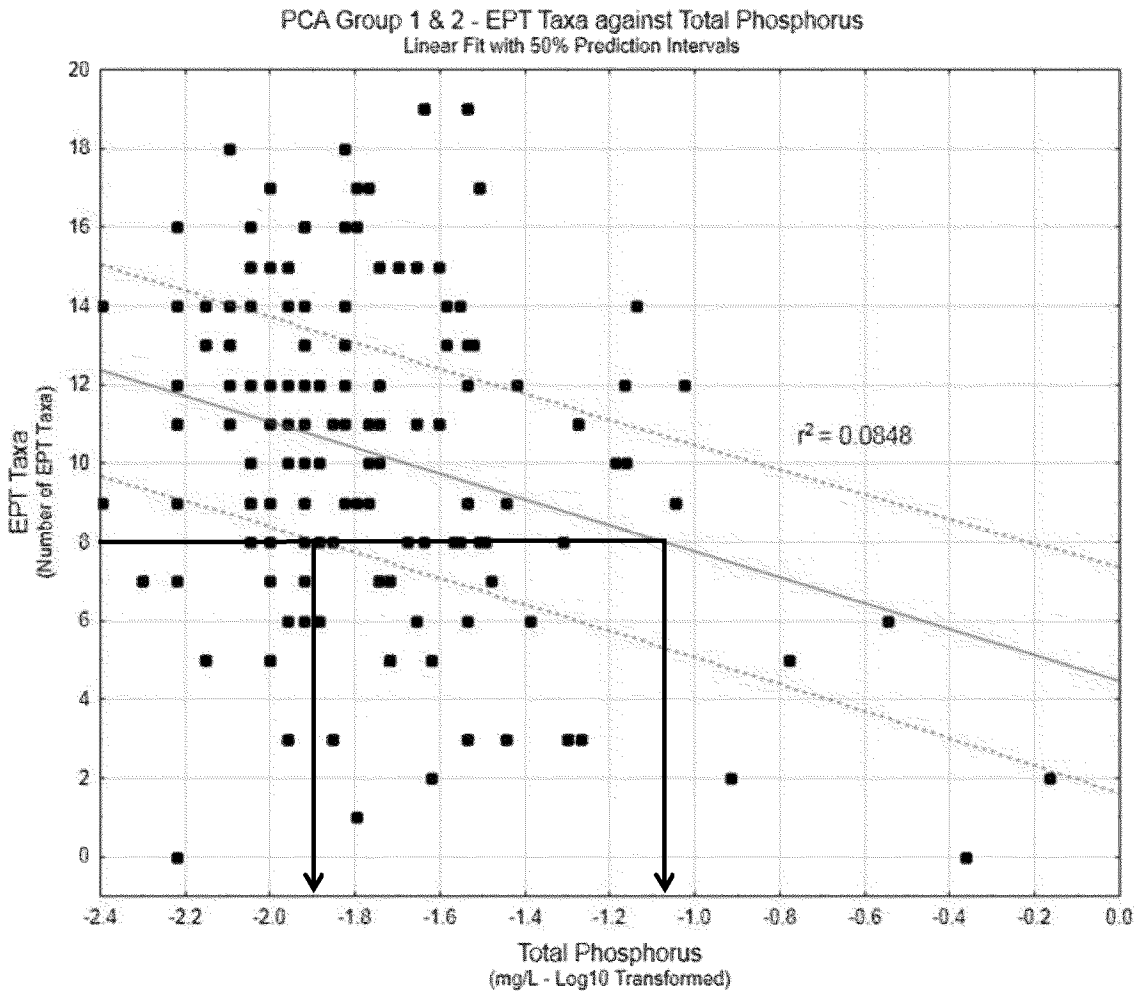

Figure 8 – Scatterplot of standardized TP concentration versus EPT taxa for Group 1,Group 2, and Groups 1 and 2 combined. Lines indicate TP lower quartile and average TP concentrations associated with the EPT richness endpoint (8). Hatched lines are the 50% prediction interval.

Similar analyses were conducted for percent intolerant urban and percent clinger metrics (Figures 9-12). These same metrics once again indicate a strong confounding effect of the most urban group (group 3), affecting the sites with low metric values and low TP values (Figures 9 and 10). Once again, by looking at the groups independently and groups 1 and 2 combined, the confounding effects of these urban covariates could be reduced allowing a clearer focus on the threshold TP concentration associated with adverse metric conditions in piedmont streams (Figures 11 and 12).

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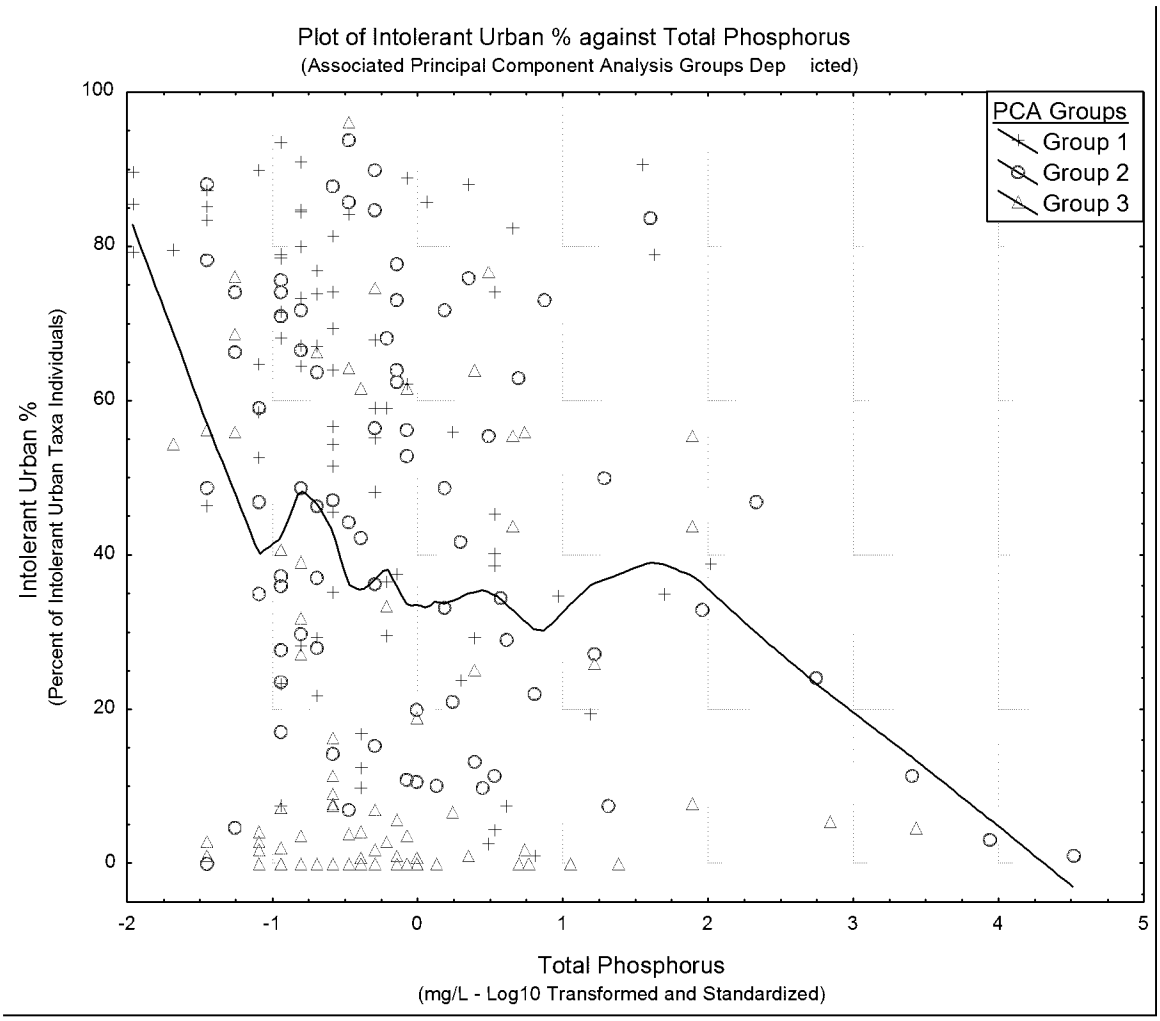

Figure 9 - Scatterplot of standardized TP concentration versus the percent intolerant urban metric for MBSS piedmont sites. Red triangles are group 3 (most urban), blue circles group 2, and black crosses group 1 (least urban).

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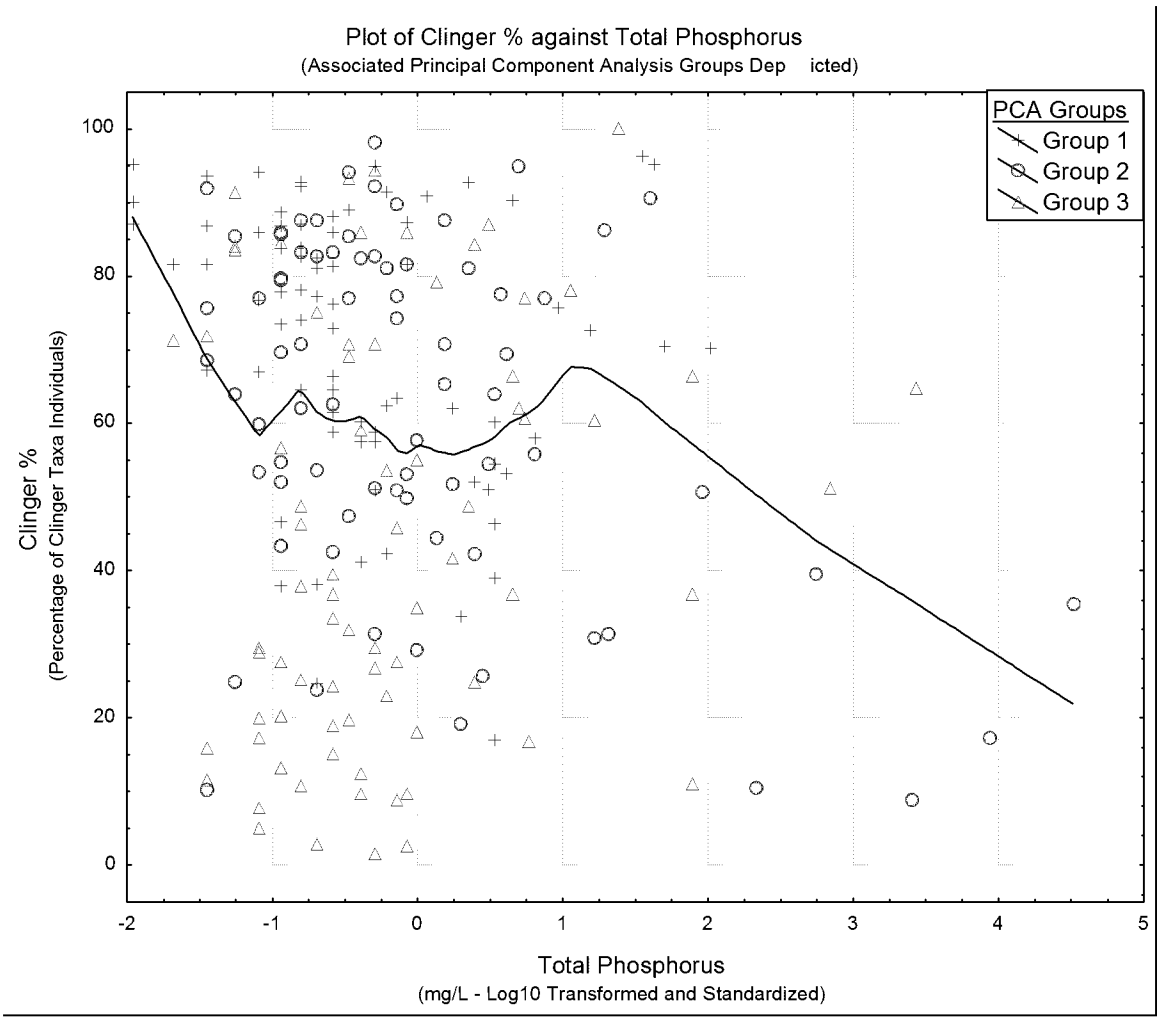

Figure 10 - Scatterplot of standardized TP concentration versus the percent clinger individuals metric for MBSS piedmont sites. Red triangles are group 3 (most urban), blue circles group 2, and black crosses group 1 (least urban).

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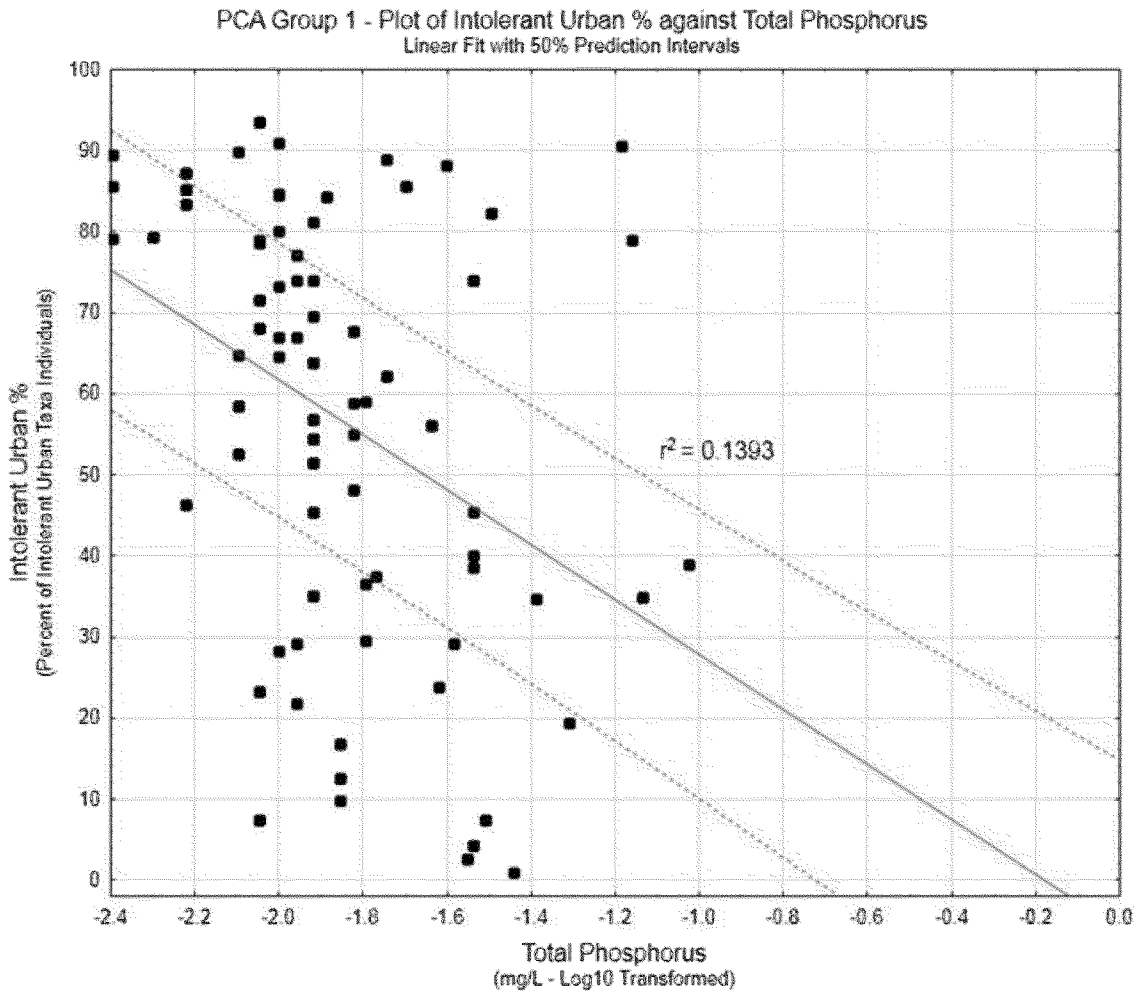

Figure 11 – Scatterplot of standardized TP concentration versus percent intolerant urban metric for Groups 1. Hatched lines are the 50% prediction interval.

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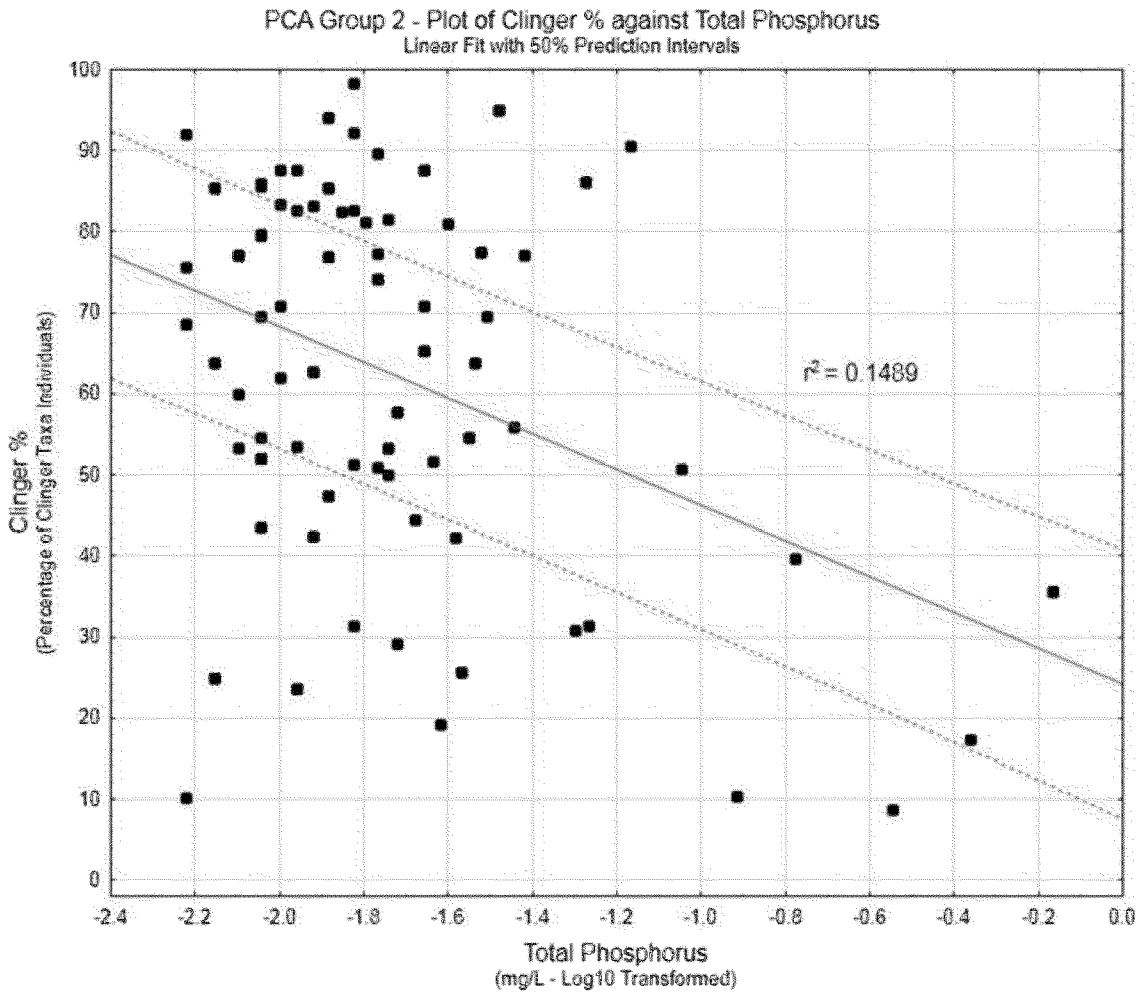

Figure 12– Scatterplot of standardized TP concentration versus percent clinger metric for Group 2. Hatched lines are the 50% prediction interval.

The range in TP concentrations interpolated from the intersection of the metric threshold values for percent intolerant urban (31.5%) for group 1 sites (r^2=0.139) was 16 to 78 µg/L and for group 2 sites (r^2=0.105) was 8 to 82 µg/L. Similar interpolated values for the percent clingers metrics (metric threshold = 52.5%) was 8 to 52 µg/L for the lower quartile and average prediction, respectively, for group 2 sites (r^2=0.137). Using group 1 and 2 combined for percent intolerant urban and group 1 and group 1 and 2 combined sites for the percent clinger models did not produce significant predictions.

Table 7 summarizes the prediction ranges from the different simple linear regression model predictions of TP for the three metrics explored.

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Table 7 – Summary of interpolated TP concentrations (μg/L) associated with target response metric thresholds for different groups (bins) of sites based on urban intensity.

		Interpolated TP (ug/L)	
Metric	Groups	lower quartile	average
EPT Taxa	Group 2	10	60
	Groups 1 and 2	10	85
Percent Intolerant Urban	Group 1	16	78
	Group 2	8	82
Percent Clingers	Group 2	8	52

7. MODEL VALIDATION

There was a desire to provide some validation of the model linking invertebrate response to nutrients with independent data, consistent with revised USEPA guidance (USEPA 2010) to strengthen the basis for the inference. Data from USGS on stream nutrient concentrations and invertebrate metric response was made known to EPA (Rief 1999, 2000, 2002a, 2002b). These data were collected with similar but distinct sampling methods and to different fixed counts than the MBSS sample data. When the data were corrected with simple rarefaction to estimate taxa richness using a comparable number of individuals as recommended by basic ecological theory, what is evident from the rarefaction exercise is even given the difference in sampling habitat and sampling design, rarefied samples fit within the wedge shaped plot identified in the original relationship (Figure 13), supporting the original observation that invertebrate richness decreases with increasing nutrient concentrations and that this general decline begins at approximately 30-40 μg/L. Additional corrections for differences in the habitat and sampling design would likely improve the fit. These data support the trends observed in the MBSS data and provide independent reinforcement for the causal model.

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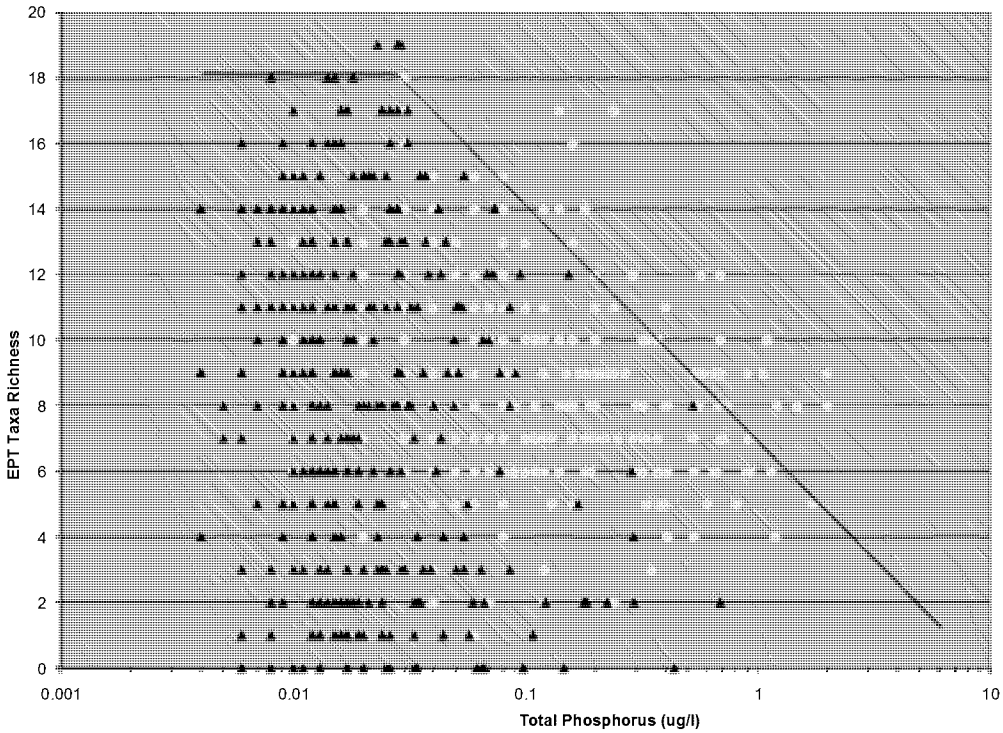

Figure 13 – Plot of TP versus EPT taxa richness for the MBSS (black triangle) and USGS Chester County datasets. The black lines indicate the locations of the approximate wedge shaped relationship between invertebrate response and TP concentration. The outer decline in EPT richness begins at a concentration of approximately 30-40 ug/L TP.

8. Mechanistic Modeling

Another line of evidence considered in the analysis of data for developing thresholds that was not included in the original report, was the use of a mechanistic model to estimate TP concentrations associated with adverse benthic algal concentrations in a Piedmont stream in Pennsylvania. A dynamic linked process model of Indian Creek using the Generalized Watershed Loading Functions (GWLF) and EPA's Environmental Fluid Dynamics Code (EFDC) was developed and used to evaluate average TP concentrations associated with exceeding a target benthic chlorophyll *a* density of 100 mg/m^2, a density on the conservative end of that frequently cited as a nuisance concentration (e.g., Dodds and Welch 2000, Suplee et al. 2008).

Watershed loads were simulated using GWLF and the in-stream water quality results were predicted using EFDC. The linked modeling system considers the loadings of nitrogen and phosphorus from all sources including point sources and non-point sources. The point source discharges of flow and nutrients were obtained from USEPA's DMR database. The non-point sources of runoff and nutrients are simulated using the GWLF model.

The GWLF model was first calibrated using observed data to ensure correct representation of the runoff and loading yield processes. Runoff and nutrient load predictions from GWLF

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were then input to the EFDC model. The EFDC model simulates the transport of nutrients and other dissolved or particulate materials from upstream to downstream in the creek. It also simulates water temperature dynamically using weather data. The simulated water temperature is passed to EFDC's eutrophication module to model dynamics of benthic algae under the influence of water temperature, available solar radiation, and available nitrogen and phosphorus. Continuously observed DO data and grab samples of nutrients were used to support model calibration, which involved determining key benthic algae parameters including growth rate, metabolism rate, and excretion rate.

Figures 14 through 17 are examples of the Indian Creek EFDC model calibration results. No benthic chlorophyll *a* data were available for calibration; DO was used as an indicator of benthic algae based on the understanding that the DO fluctuation is mainly caused by the benthic algae in Indian Creek. A detailed discussion of model configuration, calibration, and application can be found in the EPA's Indian Creek TMDL report (EPA 2008).

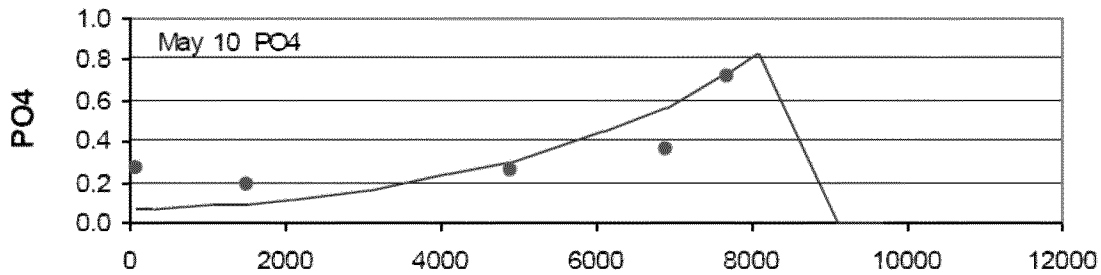

Figure 14 - Longitudinal profile of modeled and observed orthophosphate concentration (mg/L) in Indian Creek. The distance is meters from the mouth of Indian Creek. Red dots are data and blue line is model results.

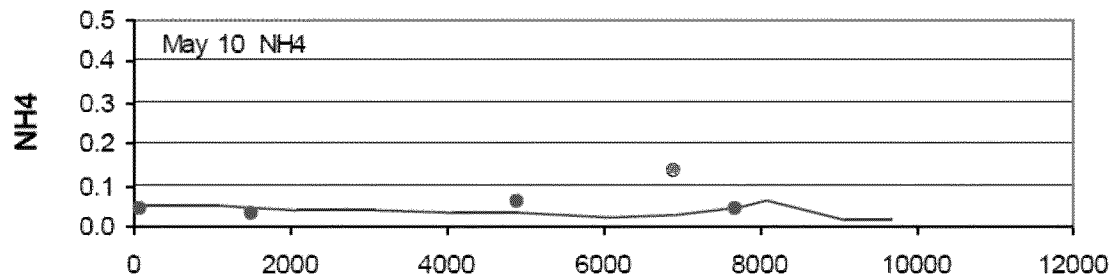

Figure 15 - Longitudinal profile of modeled and observed ammonia concentration (mg/L) in Indian Creek. The distance is meters from the mouth of Indian Creek. Red dots are data and blue line is model results.

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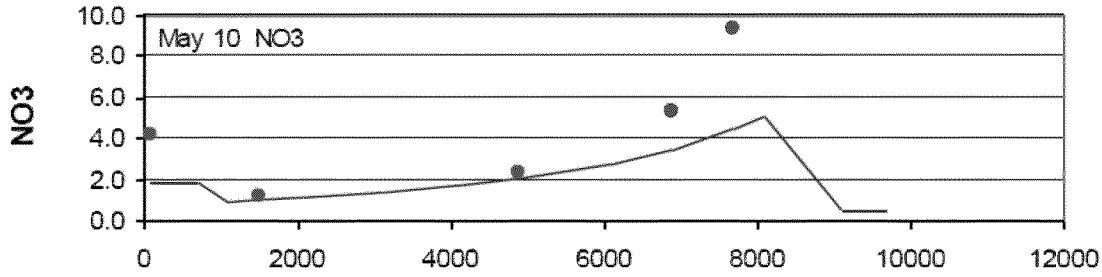

Figure 16 - Longitudinal profile of modeled and observed nitrate concentration (mg/L) in Indian Creek. The distance is meters from the mouth of Indian Creek. Red dots are data and blue line is model results.

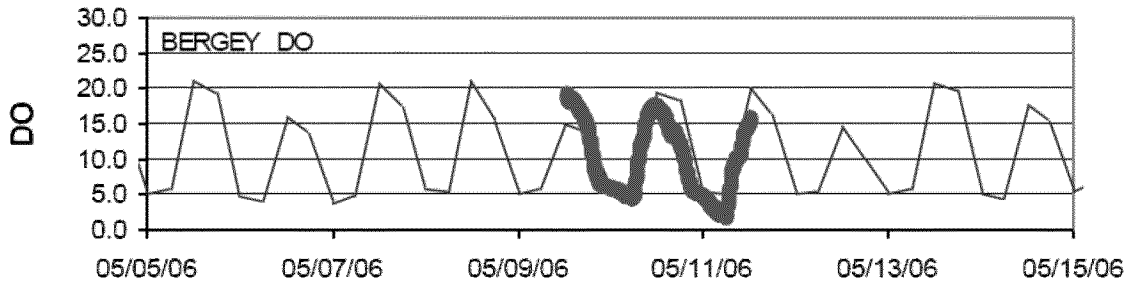

Figure 17 - Comparison of modeled and observed DO concentration (mg/L) at Bergey Rd. Red dots are data and blue line is model results.

After the model calibration parameters were determined, the model was applied to examine the level of nutrients required to achieve the desired average benthic algal density of 100 mg / m^2, of chlorophyll *a*. The process was iterative with some initial estimates regarding reduction of nutrients. No other factors, including solar radiation and water temperature were changed.

As nutrient loads were reduced, the resulting chlorophyll *a* levels were compared to the target benthic density (100 mg/ m^2). Results indicate that when average TP concentrations are between 20-33 µg/L in Indian Creek, average benthic chlorophyll *a* levels are predicted to remain near the 100 mg/ m^2 desired threshold. These levels are slightly lower than/consistent with the average TP concentration targets derived by the multiple lines of evidence approach. Figure 18 shows predicted chlorophyll *a* levels for existing conditions and after reduction conditions at the Bergy Road location. These are directly resulting from reduced TP inputs.

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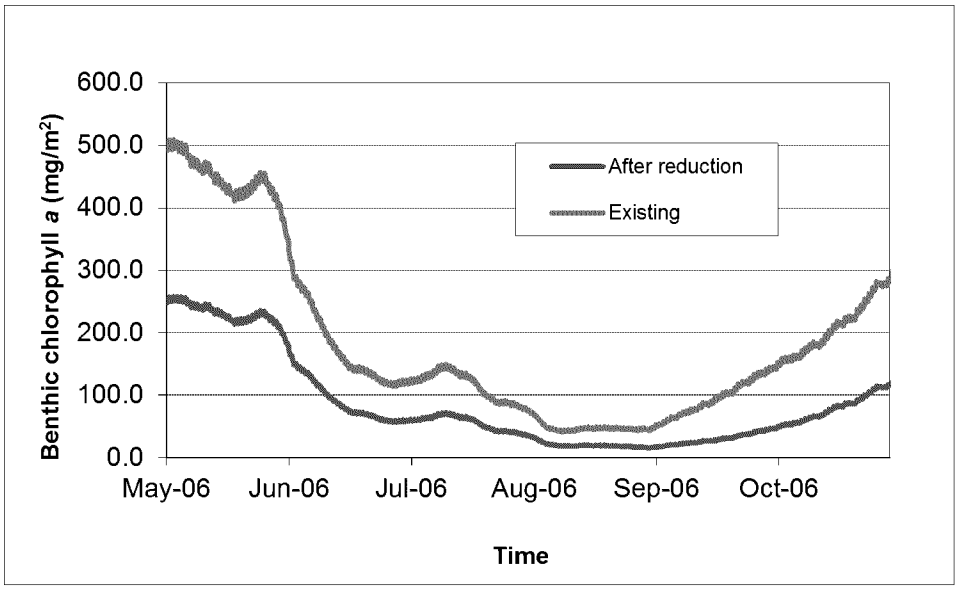

Figure 18 - Predicted periphyton (chlorophyll *a*) before and after simulated phosphorus reductions (Indian Creek, Bergey Rd sampling location).

9. Scientific Literature

The scientific literature was another line of evidence used in the original analysis. One study (Herlihy and Sifneos 2008), in particular, seemed relevant since the original PA TMDL TP target report was written; namely an analysis of national nutrient data collected as part of the USEPA Wadeable Streams Assessment (WSA, USEPA 2006). The WSA is the first comprehensive national probabilistic survey of streams in the US and included data collected from identified least disturbed reference streams (sensu Stoddard et al. 2006). The data collected in that study were used to estimate reference stream nutrient concentration upper quartiles, consistent with USEPA's original recommended regional criteria methodology and recommended in USEPA guidance (USEPA 2000). The 75th percentile TP concentrations in reference streams from the comparable nutrient ecoregion to the PA Piedmont were 60 μg/L.

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10. UPDATED ENDPOINT SUMMARY

The following table updates the original report endpoint summary table with the additional analysis and information provided in this report.

Table 8 - Summary of candidate endpoints for each of the analytical approaches discussed.

	Approach	TP Endpoint (µg/L)
Reference Approach		**2-37**
	Reference Site 75th Percentile	16-17
	All Sites 25th Percentile	17
	Modeled Reference Expectation	2-37
Stressor-Response		**8-85**
	Conditional Probability – EPT taxa	38
	Conditional Probability - % Clingers	39
	Conditional Probability - % Urban Intolerant	64
	Conditional Probability - Diatoms TSI	36
	Simple linear regression interpolation – EPT taxa	10-85
	Simple linear regression interpolation – Percent intolerant urban individuals	8-82
	Simple linear regression interpolation – Percent Clinger individuals	8-52
Other Literature		**13-100**
	USEPA Recommended Regional Criteria	37
	USEPA Regional Criteria Approach – Local Data	40-51
	Algal Growth Saturation	25-50
	Nationwide Meta-Study TP-Chlorophyll	21-60
	USGS Regional Reference Study	20
	USGS National Nutrient Criteria Study	13-20
	New England Nutrient Criteria Study	40
	Virginia Nutrient Criteria Study	50
	New Jersey TDI	25-50
	Delaware Criteria	50-100
	National Reference Criteria Study	60
Mechanistic Model		**20-33**
	Indian Creek	20-33

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Given the resultant concentrations from the new stressor-response analyses and the fact that the range of endpoints derived with that method included the recommended endpoint (i.e., between the lower quartile and average estimate ranges), that distribution based values remain unaltered, that one additional scientific study estimating regional reference concentration recommends a value similar to the original value and in the range of previous literature, and that a process model of chlorophyll in streams used to derive a TP endpoint to meet acceptable benthic chlorophyll concentrations reached a comparable value, the recommended TP endpoint in the original report (40 μg/L) remains unaltered in the opinion of the authors.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C. 20460

OFFICE OF THE ADMINISTRATOR
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April 27, 2010

EPA-SAB-10-006

The Honorable Lisa P. Jackson
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Subject: SAB Review of Empirical Approaches for Nutrient Criteria Derivation

Dear Administrator Jackson:

EPA's Office of Water (OW) requested that the Science Advisory Board (SAB) review the Agency's draft guidance document titled *Empirical Approaches for Nutrient Criteria Derivation* ("Guidance"). The Guidance is one of a series of technical documents developed by OW to describe approaches and methods for developing numeric criteria for nutrients. The Guidance specifically focuses on empirical approaches for determining stressor-response relationships to derive numeric nutrient criteria. In response to the Agency's advisory request, the SAB Ecological Processes and Effects Committee, augmented with additional experts, met on September 9-11, 2009 to conduct a peer review of the Guidance. OW requested that the SAB: 1) comment on the technical merit of the methods and approaches described in the Guidance; 2) suggest approaches that might be considered to improve the Guidance; and 3) offer suggestions to improve the utility of the Guidance for state and tribal water quality scientists and resource managers. The enclosed advisory report provides the advice and recommendations of the Committee.

The SAB commends EPA for addressing nutrient issues. Nutrients (nitrogen and phosphorus) are a major cause of impairment in the quality of the Nation's waters, and the SAB recognizes the importance of EPA's efforts to develop numeric nutrient criteria. The stressor-response approach is a legitimate, scientifically based method for developing numeric nutrient criteria if the approach is appropriately applied (i.e., not used in isolation but as part of a weight-of-evidence approach). We encourage the Agency to continue this important work.

EPA's draft Guidance provides a primer on a limited set of statistical methods that could be used in deriving nutrient criteria based on stressor-response relationships. However, in its present form, the Guidance does not present a complete or balanced view of using the statistical

methods to develop criteria. Restructuring and substantial revision of the Guidance is needed prior to its release to make the document more useful to state and tribal water quality scientists and resource managers.

In general, we find that the scope and intended use of the Guidance should be more clearly identified. The empirical stressor-response framework described in the Guidance is one possible approach for deriving numeric nutrient criteria, but the uncertainty associated with estimated stressor-response relationships would be problematic if this approach were used as a "stand alone" method because statistical associations do not prove cause and effect. We therefore recommend that the stressor-response approach be used with other available methodologies in the context of a tiered approach where uncertainties in different approaches are recognized, and weight-of-evidence is used to establish the likelihood of causal relationships between nutrients and their effects for criteria derivation. In this regard, we recommend that EPA more clearly articulate how this particular guidance fits within the Agency's decision-making and regulatory processes and, specifically, how it relates to and complements EPA's other nutrient criteria approaches, technical guidance manuals, and documents. The SAB also recognizes that methods in the Guidance do not address downstream impacts of excess nutrients.

The SAB has provided many recommendations to improve the Guidance and strongly recommends that they be incorporated into the final document. These recommendations focus on revising the document to address: cause and effect; the utility and limitations of the statistical methods and approaches in the document; the supporting analyses and data needed to correctly identify predictive relationships; the need for more guidance and examples to describe when and how to use various methods and approaches; linkages among designated uses and stressors; and the need for a more specific and descriptive framework outlining the steps in the criteria development process. Finally, the SAB strongly recommends that EPA invest in providing the technical support and training needed to make the approaches and methods in the final Guidance more useful to state and tribal water resource managers.

Thank you for the opportunity to review this important guidance document. The SAB looks forward to receiving the Agency's response to this advisory report and stands ready to provide additional advice as EPA continues to develop nutrient criteria guidance.

Sincerely,

/Signed/

Dr. Deborah L. Swackhamer, Chair
Science Advisory Board

/Signed/

Dr. Judith L. Meyer, Chair
Ecological Processes and Effects Committee

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1. EXECUTIVE SUMMARY

EPA's Office of Water (OW) requested that the Science Advisory Board (SAB) conduct a peer review of Agency's draft guidance document, *Empirical Approaches for Nutrient Criteria Derivation* (the "Guidance"). The Guidance was developed by OW to provide information for state and tribal water resource managers on empirical stressor-response approaches for developing numeric nutrient criteria. In response to the Agency's advisory request, the SAB Ecological Processes and Effects Committee reviewed the Guidance. To augment the expertise on the Committee for this advisory activity, several additional scientists with specific knowledge and expertise in assessing the effects of nutrient enrichment in aquatic systems also participated in the review.

EPA's Office of Water develops ambient water quality criteria that serve as guidance to states and tribes for adoption of water quality standards. The water quality standards include designated uses, such as aquatic life protection and recreation, and criteria that define levels of water quality variables protective of the designated uses. Because nutrients (nitrogen and phosphorus) are a major cause of impairment in the quality of the Nation's waters, state adoption of numeric nutrient criteria in water quality standards has been a high priority for OW. To assist the states and tribes in developing numeric nutrient criteria, OW published technical guidance manuals for developing nutrient criteria for lakes and reservoirs (U.S. EPA, 2000a), rivers and streams (U.S. EPA, 2000b), estuaries and coastal marine waters (U.S. EPA, 2001), and wetlands (U.S. EPA, 2008). These technical guidance manuals focus primarily on describing a reference condition approach for deriving criteria from distributions of nutrient concentrations and biological responses in minimally disturbed reference waterbodies. Other basic analytical approaches for nutrient criteria derivation recognized in the manuals include mechanistic modeling (i.e., predicting the effects of changes in nutrient concentrations using site-specific parameters and equations that represent ecological processes), which EPA intends to address as the subject of a later document, the stressor-response approach (discussed in the Guidance and considered in this advisory report), and the application and/or modification of established nutrient/algal thresholds. The stressor-response approach involves quantifying the relationship between nutrient concentrations and biological response measures related to the designated use of a waterbody.

The Guidance outlines a five-step process for developing numeric nutrient criteria. It describes data analysis methods and approaches that could be used in each of these steps. Step one involves the use of exploratory analysis and data visualization tools to select variables that appropriately quantify the stressor (i.e., excess nutrients) and the response. Step two involves the use of conceptual models, existing literature, and other methods to assess the strength of the relationship represented in the stressor-response linkage. Step three involves the use of various statistical methods to analyze data, estimate stressor-response relationships, and identify thresholds that may be used to derive water quality criteria. Step four involves the evaluation of estimated stressor-response relationships (including validation of predictive performance for a stressor-response model, and selecting a model that best represents the data). Step five involves evaluating candidate nutrient criteria by predicting conditions that might be expected after implementing different criteria. The Guidance contains five sections, each addressing one of the proposed steps in the criteria development process. In its charge to the SAB, EPA requested that

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the Committee comment on the methods and approaches described in each section of the Guidance, recommend other approaches that might be considered, and offer suggestions to improve the utility of the Guidance for state and tribal water quality scientists and resource managers. In its responses to the charge questions, the Committee provides comments and recommendations to improve the Guidance and assist EPA in its efforts to support the development of numeric nutrient criteria.

General comments on the Guidance

The Committee recognizes the importance of EPA's efforts to support numeric nutrient criteria development and encourages the Agency to continue this important work. In addition, we recognize the stressor-response approach as a legitimate, scientifically based method for developing numeric nutrient criteria if it is appropriately applied (i.e, not used in isolation but as part of a tiered weight-of-evidence approach using individual lines of evidence as discussed here). The draft Guidance provides a primer on a limited set of statistical methods that could be used in deriving numeric nutrient criteria. However, we find that improvements in the Guidance are needed prior to its release to make the document more useful to state and tribal water quality scientists and resource managers.

In general, we find that the scope, limitations, and intended use of the Guidance should be more clearly described. The Guidance addresses only one type of "empirical" approach for derivation of numeric nutrient criteria (i.e., the stressor-response framework). As illustrated in many of the examples in the Guidance, considerable unexplained variation can be encountered when attempting to use the empirical stressor-response approach to develop nutrient criteria. The final Guidance should clearly indicate that such unexplained variation presents significant problems in the use of this approach. Further, the final document should clearly state that statistical associations may not be biologically relevant and do not prove cause and effect. However, when properly developed, biologically relevant statistical associations can be useful arguments as part of a weight-of-evidence approach (further discussed in Section 3.3, recommendation #7 of this advisory report) to criteria derivation. Therefore, the final Guidance should provide more information on the supporting analyses needed to improve the basis for conclusions that specific stressor-response associations can predict nutrient responses with an acceptable degree of uncertainty. Such predictive relationships can then be used with mechanistic or other approaches in a tiered weight-of-evidence assessment including cause and effect relationships to develop nutrient criteria.

Tiered environmental assessment is iterative. The initial assessment is the simplest (e.g., minimal ecosystem specific data) and most conservative (i.e., risks must be assumed in the absence of system-specific information), and thus, will not always provide sufficient certainty for decision-making. Cause and effect relationships would be inferred but not demonstrated; only a few lines of evidence would be available and the corresponding uncertainty great. At the highest tier, there would be several lines of evidence and factors that would confound the prediction of effects, such as other stressors or the morphology of the waterbody, and these need to be understood and considered. Successive tiers involve more focused (e.g., specific for particular ecosystem types) investigations, based on the results of the previous tier. Data needs are relatively few at the initial tier, but increase at successive tiers. However, through additional

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testing, measurement, or modeling, uncertainty decreases at successive tiers, and sources of uncertainty become better understood. Policy makers require information to understand the uncertainty associated with regulatory decisions, and to determine how much uncertainty may or may not be acceptable in particular decision-making contexts. Weight-of-evidence typically determines the tier at which uncertainty has been reduced sufficiently for informed management decision-making. It is important to explicitly describe and consider uncertainty at each step of the criteria development and decision-making process. The level of uncertainty of the conceptual model is likely to be rather low, as it is mostly based on well-established general principles of aquatic systems. Here the uncertainty is about how well the selected conceptual model fits the specific stressors and ecological systems under consideration. As criteria are developed it is important to address uncertainty associated with more specific factors that influence biological responses to nutrient inputs because uncertainty may cascade down through the analysis, in effect multiplying the uncertainty in later steps of the analysis.

The Committee also recommends that EPA more clearly articulate how the Guidance fits within the Agency's decision-making and regulatory processes and, specifically, how it relates to and complements EPA's other nutrient criteria technical guidance manuals and documents. As further discussed in the response to Charge Question 1, numeric nutrient concentration criteria and load-response models should be considered as two different approaches for accomplishing the goal of controlling excessive nutrient loadings. In addition, the Committee notes that the methods in the Guidance do not address the problem of excess nutrient enrichment downstream from waters for which the criteria are being developed. There is a need for methods to address this problem (one of which could be load-response modeling) and it should be clearly stated that this is beyond the scope of the current guidance document.

Charge Question 1. Improving the utility of the Guidance for state and tribal water quality scientists and resource managers

What suggestions do you have that will improve the utility of the draft document, Empirical Approaches for Nutrient Criteria Derivation, for State water quality scientists and resource managers to derive numeric nutrient criteria based on stressor-response relationships?

The Committee finds that improvements in EPA's Guidance are needed to make the document more useful to state and tribal water quality scientists and resource managers and to ensure against inadvertent misuse. In this regard, as previously mentioned, the scope, limitations, and intended use of the document should be more clearly identified.

- The Committee recommends that EPA more clearly articulate how the Guidance fits within the Agency's decision-making and regulatory processes and, specifically, how it relates to and complements EPA's other nutrient criteria technical guidance manuals and documents.

- In the Guidance, and the Agency's related technical manuals, EPA should more clearly address the importance of: 1) establishing linkages among designated uses and measured responses, stressors and measures of stressors; and 2) relating measures of stressors directly to deleterious effects on designated uses.

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- The Committee finds that the Guidance: 1) should provide a more specific and descriptive framework outlining the steps in the criteria development process (Figure 1 of this advisory report illustrates EPA's proposed framework for developing nutrient criteria and the SAB recommendations for revision of the framework); 2) must be detailed and sophisticated enough to ensure statistical rigor, but additional support must also be provided by EPA to help users meet the technical demands of the methods; 3) should more clearly express the caveats and limitations of the statistical methods and approaches in the document, in particular the fact that statistical correlations do not establish cause and effect; 4) should contain more technical guidance and examples to describe when and how to use various methods and approaches; and 5) should provide additional guidance on data requirements for application of the statistical methods and approaches.

- *Charge Question 2. Selecting stressor and response variables*

Section 1 of the draft guidance document reviews how to select the variables that appropriately quantify the stressor (i.e., excess nutrients) and the response (e.g., chlorophyll a, dissolved oxygen, or a biological index). Please comment on whether the factors to consider described in Section 1 of the draft document are appropriate for selecting response variables that are sensitive to nutrients and related to measures of designated uses.

In Section 1 of the Guidance, EPA discusses factors to consider when selecting the stressor and response variables. In this regard, the Committee finds that EPA should strengthen the Guidance by including additional material.

- The examples in the Guidance rely heavily on taxa richness as a response variable. Some rationale as to how this variable relates to a designated use should accompany these examples. The coupling of response variables to designated uses must be clear and the rationale explained. Further, the Guidance could be strengthened considerably by presentation of examples showing strong nutrient-response relationships with response variables that are clearly linked to designated uses.

- The Committee notes that co-limitation by both nitrogen and phosphorus may be common in many systems and regions. Therefore, the use of multivariate or data stratification approaches may be needed to identify nutrient-response relationships.

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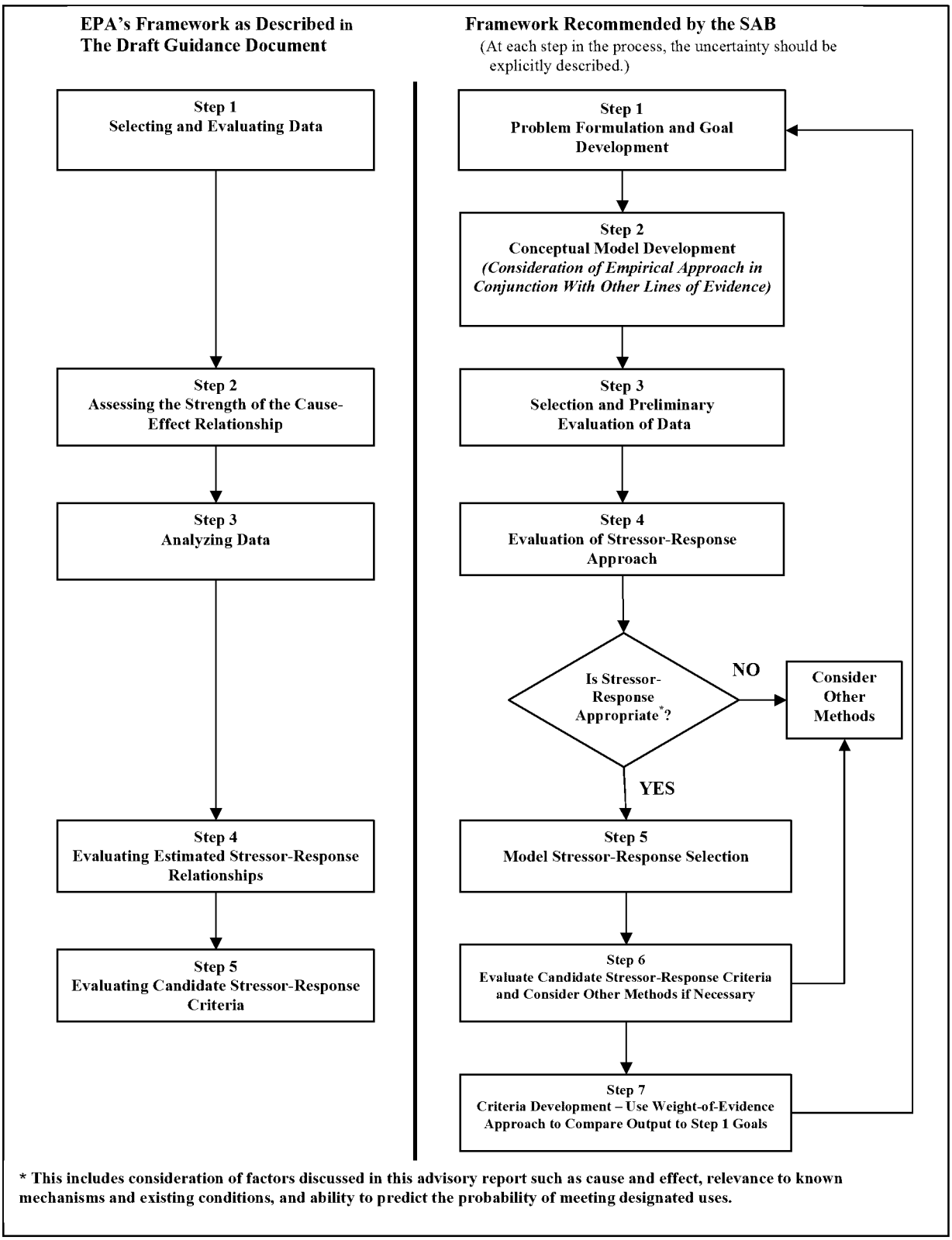

Figure 1. EPA's Framework for Developing Nutrient Criteria Based on Stressor-Response Relationships and SAB Recommendations for Revision

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- The Guidance should provide more information on the data needed to characterize other stressor and constraint variables (e.g., high dissolved organic carbon versus low dissolved organic carbon lakes, shaded versus unshaded streams) which are critical for applying multivariate techniques or for stratification/classification of univariate nutrient-response relationships.

- The Guidance focuses on total nitrogen and total phosphorus as the primary nutrient stressor variables. In systems where inorganic nutrients are the dominant form, additional consideration should be given to inorganic nitrogen and phosphorus.

- The Guidance focuses on nutrient-response pathways driven by autotrophic processes (nutrients directly control algal growth and excessive amounts of algae impair systems through indirect effects on dissolved oxygen, food web changes, and aesthetics). The Committee notes that nutrients can also directly control heterotrophic microbes (bacteria and fungi) and indirectly control decomposition of organic matter. This should be more fully discussed in the Guidance.

- The Guidance provides inadequate discussion of the temporal/spatial aspects of data needed to develop relevant stressor-response relationships. The Guidance should discuss the conditions under which mean/median or maximum/minimum values of stressor and response variables might be more appropriate than discrete instantaneous measurements for developing stressor-response relationships. The use of time series data to describe specific systems should also be addressed. Although such guidance may be provided in various system-specific technical manuals (e.g., U.S. EPA, 2000a, b), a summary synthesis of the major points in these earlier documents should be included in the Guidance.

Charge Question 3. Approaches to demonstrate the distribution of and relationships among variables

Section 1 outlines methods to visualize available data. Please comment on the effectiveness of the following approaches described in the document (listed below) to demonstrate the distribution of and relationships among variables.

a) Basic data visualization techniques
b) Maps
c) Conditional probability
d) Classifications

Section 1 of the Guidance discusses exploratory data analysis, and presents several methods for demonstrating the distribution of and relationships among variables. In Subsections 1.2 - 1.6 several basic plotting techniques are presented. This is followed by a description of conditional probability analysis (a statistical approach for summarizing how changes in nutrient concentrations are associated with the probability of waterbodies attaining their designated uses). The Committee finds that the discussion of exploratory data analysis would be more effective if Section 1 of the Guidance were reorganized and expanded.

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- As further discussed in the response to Charge Question 3, Subsections 1.2 - 1.6 of the Guidance should be reframed as a separate major section on exploratory data analysis, which should follow another separate major section on problem formulation. The material in Subsection 1.1 (selection of stressor-response variables) should be moved to a later section of the document.

- The Guidance should stress that exploratory data analysis, including data visualization, should be conducted prior to inferential statistical analyses of potential stressors and responses. The objectives of exploratory data analysis should be to better understand the system of interest and to maximize accuracy and minimize variability of subsequently derived stressor-response relationships.

- Additional methods for exploratory data analysis should be discussed in the Guidance. These additional methods should include: use of summary statistics, time series plots at fixed points in space; longitudinal plots at fixed points in time; bubble plots; Pearson and other correlation analyses; and maps that show temporal (monthly, seasonal, inter-annual) as well as spatial patterns.

- Clear guidance is needed on when and how to use the statistical methods and visualization techniques presented in the document. The strengths and limitations of the methods should also be clearly identified. It would be useful to show several case examples that range from state-wide to local and data-rich to data-poor; and exemplify different types of aquatic ecosystems (e.g., headwater streams, large rivers, lakes and estuaries). Examples should note the strengths, limitations, assumptions and uncertainties that must be considered when using the methods to explore and visualize the data. These examples should demonstrate how nutrients can be identified as significant stressors in the presence of multiple stressors and habitat factors that may affect the resident communities.

- Subsection 1.6 of the Guidance (examination of stressor-response distributions across different classes, e.g., ecoregions) should be expanded. The subsection should discuss additional data analyses and examples for different spatial classifications (e.g., ecoregions, states, watersheds, systems of interest), different waterbody types (e.g., streams, rivers, lakes, estuaries) and other important physical and chemical characteristics of systems that could affect the applicability of the nutrient criteria.

Charge Question 4. Methods for assessing the strength of the cause-effect relationship

Section 2 of the draft guidance document describes methods for assessing the strength of the cause-effect relationship represented in the stressor-response linkage. Please comment on whether the draft guidance document adequately describes how conceptual models, existing literature, and empirical models can be used to assess how changes in nutrient concentration are likely to cause changes in the chosen response variable.

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Section 2 of the Guidance provides a summary of how the strength of candidate stressor-response pairings from step 1 can be assessed. The Committee recommends a number of improvements in this section.

- It is appropriate to use conceptual models and existing literature as the scientific basis to assess how changes in nutrient concentrations might affect response variables. However additional discussion of conceptual model selection, with specific examples, would be helpful. As illustrated in Figure 1 of this advisory report and further discussed in the response to Charge Question 7, the Committee recommends that development of the conceptual model occur in or immediately after the problem formulation step, early in the process of criteria development.

- Structural Equation Modeling (SEM) is discussed in the Guidance as a method for exploring nutrient-ecosystem response. The Committee finds that use of SEM should be more fully explained. Clear examples of its use should be provided.

- The Guidance discusses the use of Propensity Score Analysis (PSA) to estimate stressor-response relationships. PSA seems to be useful for sorting out groups that share covariates but may have unique nutrient characteristics. Such sorting could lead to a clearer understanding of how nutrients function amid multiple covariates. The example of PSA in the Guidance appendix is helpful, but further explanation of how to interpret the results of the analysis is needed. An analysis such as PSA should be discussed in a later section of the Guidance because it is a tool for analyzing data (Section 3 of the Guidance) rather than supporting potential relationships.

- It is not clear why EPA did not include information obtained from mechanistic models in Section 2 of the Guidance. Because mechanistic models can integrate information on the interactions of major ecosystem processes to derive quantitative estimates of effects, they should be discussed as a means to interpret the stressor-response relationship.

Charge Question 5. Statistical methods to analyze the data

Section 3 of the draft guidance document outlines statistical methods to analyze the data to estimate stressor-response relationships. Please comment on the appropriateness of the methods outlined in the document (listed below) for describing stressor-response relationships associated with nutrient pollution. What approaches would you recommend that could effectively address indirect pathways of adverse effects? What recommendations do you have to address the effects of confounding variables and uncertainty in the estimated relationships?

a) Simple linear regression
b) Quantile regression
c) Logistic regression
d) Multiple linear regression
e) Non-parametric changepoint analysis
f) Discontinuous regression models

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Section 3 of the Guidance describes a number of statistical methods for analyzing data to estimate stressor-response relationships. The Committee provides comments addressing the appropriateness of statistical methods for estimating stressor-response relationships.

- Methods described in the Guidance are generally appropriate for estimating stressor-response relationships in support of conceptual models. However, as further discussed in the response to Charge Question 5, more careful consideration of confounding variables is necessary to maximize the potential for stressor-response relationships to reflect cause and effect between nutrient concentrations and ecological responses. The Guidance should be revised to state this more definitively and better assist its users in achieving this objective.

- Those charged with using stressor-response methodology may require additional technical support to use the methods in the Guidance.

- EPA should provide guidance on how the degree of the relationship (indicated by R^2, residuals analysis, and other evidence) relates to establishing predictive stressor-response relationships for numeric nutrient criteria development. The Committee also notes that uncertainty must be identified and quantified for all methods and at all stages of the process.

Charge Question 6. Evaluating the predictive accuracy of stressor-response relationships

Section 4 of the draft guidance document describes how to evaluate the predictive accuracy of estimated stressor-response relationships. Please comment on the appropriateness of approaches in Section 4 of the guidance document and factors to consider in evaluating and comparing different estimates of the stressor-response relationships and selecting those most appropriate for criteria derivation.

The Committee provides comments on the appropriateness of approaches discussed in Section 4 of the Guidance and the factors to consider in evaluating and comparing different estimates of stressor-response relationships in order to select those most appropriate for criteria development. Overall, the Committee finds that this section of the Guidance lacks the detail provided in other sections and needs improvement.

- A clear framework for statistical model selection is needed. This framework should include: 1) an assessment of whether analyses indicate that the stressor-response approach is appropriate; 2) selection criteria to evaluate the capability of models to consider cause/effect and direct/indirect relationships between stressors and responses; 3) consideration of model relevance to known mechanisms and existing conditions; 4) establishment of biological relevance; and 5) ability to predict probability of meeting designated use categories.

- The concept of "validation" as presented in Subsection 4.1 of the Guidance is inconsistent with other EPA guidance (U.S. EPA, 2009a) on development, evaluation, and application of models. Model corroboration (sensu "validation") and uncertainty analysis should both be part of model evaluation and selection. These activities should be directed and informed by pre-established data quality objectives. Additional guidance is also needed on: data set

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specification and stratification; a suite of validation techniques (e.g., random or non-random held-out data, independent data, resampling/Monte Carlo); and appropriate quantitative levels of goodness-of-fit and uncertainty measures.

- With regard to validation, the Committee recommends that nutrient criteria should result from a tiered weight-of-evidence approach based on the application of multiple empirical approaches and consideration of multiple response variables as appropriate. The nutrient criteria values that may be determined, after considering validation and uncertainty, may vary significantly from technique to technique or from response variable to response variable. EPA should provide greater guidance on how to assign numeric criteria when a range of responses among analyses/models results in different values.

Charge Question 7. Evaluating candidate stressor-response criteria

Section 5 of the draft guidance document describes how to evaluate the candidate stressor-response criteria. An approach is outlined for predicting conditions that might result after implementing different nutrient criteria. Please comment on uncertainties that would remain if water quality criteria for nutrients were based solely on estimated stressor-response relationships and in what ways other information/analysis would help address and possibly reduce this uncertainty?

Section 5 of the Guidance describes how to evaluate candidate numeric nutrient criteria. The Committee provides comments on uncertainties associated with deriving candidate water quality criteria. We also recommend improvements in the Guidance to help address and reduce uncertainty.

- The Guidance describes approaches that use a data-mining exercise to demonstrate a possible cause-effect relationship for the nutrient-ecosystem response. However, as further discussed in the response to Charge Question 7, the document does not address or partition the inherent critical uncertainties associated with the stressor-response approach. We note that these uncertainties can be extremely large (e.g., several orders of magnitude). To address these uncertainties, the Guidance should better document the physical, chemical and biological variables comprising the morphological relationships (e.g., habitat, spatial, and temporal) that define the aquatic system of interest, and which may be important in modifying the relationship between nutrient concentrations (both nitrogen and phosphorus) and observed endpoints. These factors may dominate the cause-effect pathway and should be documented so that uncertainty in the relationship between nutrient concentrations and measured endpoints can be reduced.

- The Guidance should indicate that, at the start of the initial problem formulation exercise, a realistic cause-effect conceptual model must be developed, and that the model should include those factors that are likely to contribute most to the change in the response variable for the specific region/system of interest. Then data analyses can be used to evaluate which of the factors, or combination of factors, caused the observed change in the response variable.

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- As further discussed in the response to Charge Question 7, when predicting conditions that might result after implementing nutrient criteria, it is important to consider environmental factors that may cause differences in nutrient concentrations and biological conditions (e.g., lead and lag times) in response to nutrient loadings.

- There is considerable uncertainty in linkage of the response variables discussed in the Guidance to the Clean Water Act goals of drinkable, swimmable, and fishable waters. The recommended response variables in the Guidance should be directly linked to these Clean Water Act goals.

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2. INTRODUCTION

EPA's Office of Water (OW) requested that the Science Advisory Board (SAB) conduct a peer review of the Agency's draft guidance document, *Empirical Approaches for Nutrient Criteria Derivation* (the "Guidance"). The Guidance was developed by EPA's Office of Water to provide information for water resource managers on the scientific foundation for using empirical approaches to describe stressor-response relationships for developing numeric nutrient water quality criteria. The SAB Ecological Processes and Effects Committee (Committee) met on September 9th-11th, 2009 to review the Guidance. To augment the expertise on the Committee for this advisory activity, several additional scientists with specific knowledge and expertise in assessing the effects of nutrient enrichment in aquatic systems also participated in the review. This report transmits the advice of the Committee.

EPA's Office of Water is charged with protecting aquatic life, wildlife, and human health from adverse water-mediated effects of anthropogenic pollutants. In support of this mission, OW develops ambient water quality criteria that serve as guidance to states and tribes for adoption of water quality standards. State and tribal water quality standards include designated uses, such as aquatic life protection and recreation, and criteria that define levels of water quality variables protective of the designated uses. Because nutrients (nitrogen - N and phosphorus - P) are a major cause of water quality impairment in the Nation's waters, state adoption of numeric nutrient criteria into water quality standards has been a high priority for OW. The Office of Water has stated that numeric nutrient water quality standards are important because they can: support development of nutrient related Total Maximum Daily Loads (TMDLs); provide targets for nutrient trading programs; and make it easier to write National Pollutant Discharge Elimination System (NPDES) permits, evaluate the success of nutrient runoff minimization programs, and measure environmental progress.

To assist states and tribes in developing numeric nutrient criteria, OW published peer reviewed technical guidance for developing such criteria for lakes and reservoirs (U.S. EPA, 2000a), rivers and streams (U.S. EPA, 2000b), estuaries and coastal marine waters (U.S. EPA, 2001), and wetlands (U.S. EPA, 2008). These technical guidance documents focus primarily on a reference condition approach for deriving nutrient criteria from distributions of nutrient concentrations and biological responses in minimally disturbed reference waterbodies. Other basic analytical approaches for nutrient criteria derivation identified in prior guidance documents include mechanistic modeling (i.e., predicting the effects of changes in nutrient concentrations using site-specific parameters and equations that represent ecological processes), the stressor-response approach, and the application and/or modification of established nutrient/algal thresholds. The stressor-response approach involves quantifying a relationship between nutrient concentrations and biological response measures related to the designated use of a waterbody. In the Guidance, EPA states that, when developing nutrient criteria, the strengths and characteristics of each analytical approach should be carefully considered with respect to data availability and designated use protection needs.

The Guidance outlines a five-step process for developing numeric nutrient criteria. Step one involves selecting variables that appropriately quantify the stressor (i.e., excess nutrients) and the

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response. The Guidance describes various techniques for exploratory data analysis to understand the properties of different variables and visualize data. These techniques include histograms, box and whisker plots, quantile-quantile plots, cumulative distribution plots, scatter diagrams, and spatial mapping. Step two involves assessing the strength of the relationship represented in the stressor-response linkage. The Guidance discusses the use of conceptual models, existing literature, and empirical models to assess the degree to which changes in nutrient concentration are likely to cause changes in a chosen response variable. Step three involves analysis of data to estimate stressor-response relationships and identify thresholds that may be used to derive criteria. The Guidance describes a number of statistical methods for analyzing data to estimate stressor-response relationships. These methods include linear regression, logistic regression, quantile regression, non-parametric changepoint analysis, and discontinuous regression modeling. Step four involves evaluating the stressor-response relationships (including validation of predictive performance for a stressor-response model and selecting a model that best represents the data). Step five involves evaluating candidate stressor-response criteria. The Guidance outlines an approach for predicting conditions that might be expected after implementing different nutrient criteria and selecting a value to optimize resource protection. The Committee was asked to comment on the scientific and technical merit of the methods and approaches discussed in the Guidance and to offer suggestions to improve the usefulness of the document to state and tribal water quality scientists and resource managers.

The Committee recognizes the importance of EPA's efforts to support numeric nutrient criteria development and encourages the Agency to continue this important work. In addition, we recognize the stressor-response approach as a legitimate, scientifically based method for developing numeric nutrient criteria if it is appropriately applied (i.e., not in isolation). The draft Guidance provides a primer on a limited set of statistical methods that could be used in deriving nutrient criteria based on stressor-response relationships. However, the Committee finds that improvements in the Guidance are needed prior to its release to make the document more useful to state and tribal water quality scientists and resource managers.

In general, we find that the scope, limitations, and intended use of the Guidance need to be more clearly described. The Guidance addresses only one type of "empirical" approach for derivation of numeric nutrient criteria (i.e., the stressor-response framework). In this regard, we strongly recommend that EPA more clearly articulate how the Guidance fits within the decision-making and regulatory processes and, specifically, how it relates to and complements EPA's other nutrient criteria technical guidance manuals and documents. As illustrated in the data analysis examples in the Guidance, a large degree of unexplained variation can be encountered when attempting to use the empirical stressor-response approach to develop nutrient criteria. The final Guidance should clearly indicate that such unexplained variation can present significant problems in the use of this approach. Further, *the final document should clearly state that statistical associations may not be biologically relevant and do not prove cause and effect.* When properly developed, statistical associations can be useful in supporting cause and effect arguments as part of a weight-of-evidence approach (further discussed in Section 3.3, recommendation #7 of this advisory report) to criteria development. Therefore, the final Guidance should provide more information on the supporting analyses needed to improve the basis for conclusions that specific stressor-response associations can predict nutrient responses with an acceptable degree of uncertainty. Such predictive relationships can then be applied, with

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mechanistic or other approaches, in a tiered weight-of-evidence assessment using individual lines of evidence in combination to develop nutrient criteria. Tiered environmental assessment is iterative. The initial assessment is the simplest (e.g., minimal ecosystem specific data) and most conservative (i.e., risks must be assumed in the absence of system-specific information), and thus will not always provide sufficient certainty for decision-making. Cause and effect relationships would be inferred but not demonstrated; only a few lines of evidence would be available and the corresponding uncertainty high. At the highest tier, there would be several lines of evidence and factors that would confound the prediction of effects, such as other stressors or the morphology of the waterbody, and these need to be understood and considered. Successive tiers will involve more focused (e.g., specific for particular ecosystem types) investigations, based on the results of the previous tier. Data needs are relatively few at the initial tier, but increase at successive tiers. However, through additional testing, measurement, or modeling, uncertainty decreases at successive tiers, and sources of uncertainty become better understood. Policy makers require information to understand the uncertainty associated with regulatory decisions, and to determine how much uncertainty may or may not be acceptable in particular decision-making contexts. Weight-of-evidence typically determines the tier at which uncertainty has been reduced sufficiently for informed management decision-making. It is important to explicitly describe and consider uncertainty at each step of the criteria development and decision-making process. The level of uncertainty of the conceptual model is likely to be rather low, as it is mostly based on well-established general principles of aquatic systems. Here the uncertainty is about how well the selected conceptual model fits the specific stressors and ecological systems under consideration. As criteria are developed, it is important to address uncertainty associated with more specific factors that influence biological responses to nutrient inputs because uncertainty may cascade down through the analysis, in effect multiplying the uncertainty at later steps.

In our responses to the charge questions we have recommended specific revisions to improve various sections of the Guidance before it is published. These recommendations focus on: modifying the framework of the Guidance to make it more specific and descriptive (as illustrated in Figure 1 of this report); providing additional information on conditions under which the stressor-response framework may apply; more clearly expressing the caveats, limitations, and data requirements associated with the approaches presented in the Guidance; providing additional information and examples showing when and how to use methods and approaches described in the document; and providing more detailed and descriptive guidance on the use of statistical methods and additional support from EPA to help users meet the technical demands of the methods.

3. RESPONSE TO CHARGE QUESTIONS

In the responses to each of the charge questions, the Committee has listed key findings and comments as bullets. These findings are followed by the Committee's key recommendations. Various aspects of some cross-cutting findings have been discussed in the responses to more than one of the charge questions and cross-references have been provided.

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3.1. Charge Question 1. Improving the utility of the Guidance

What suggestions do you have that will improve the utility of the draft document, *Empirical Approaches for Nutrient Criteria Derivation,* for State water quality scientists and resource managers to derive numeric nutrient criteria based on stressor-response relationships?

The Committee was asked to offer suggestions to improve the usefulness of the Guidance to state and tribal water quality scientists and resource managers for deriving numeric nutrient criteria based on stressor-response relationships. In this regard, we find that the following improvements in EPA's Guidance are needed.

Findings concerning improving the utility of the Guidance

- The scope, limitations, and intended use of the Guidance should be more clearly identified. The Guidance addresses only one possible approach (i.e., the stressor-response framework) for derivation of numeric nutrient criteria. The Guidance would be more useful if it: 1) expanded upon the utility of the mechanistic modeling approach for understanding stressor-response relationships and the reference condition approach for criteria derivation; 2) more clearly articulated how it relates to EPA's other published nutrient criteria guidance; 3) explained the linkages among designated uses, stressors, measures of stressors, and the deleterious effects of stressors on designated uses; 4) explained that the Guidance does not address "downstream" effects of nutrients; and 5) acknowledged other factors that have appeared to limit state progress toward developing nutrient criteria (e.g., lack of data and technical expertise, insufficient resources, or other factors).

- Substantial revision of the document is needed to facilitate identification of the most scientifically defensible approaches to deriving numeric nutrient criteria. The Committee emphasizes that understanding the causative link between nutrient levels and impairment is necessary in order to assure that managing for particular nutrient levels will lead to desired outcomes. As further discussed below, the stressor-response framework in the Guidance may often not be the most appropriate approach for deriving numeric nutrient criteria. [See the response to Charge Question 5 for additional discussion.]

- Substantial revision of the document is needed to increase its usability while reducing the likelihood of misuse. The Committee finds that the Guidance would be more useful if it: 1) provided a more specific and descriptive framework outlining the steps in the criteria development process (a specific example is illustrated in Figure 1); 2) contained more technical guidance and examples to describe when and how to use various methods and approaches in the document and ensure statistical rigor (with additional support provided from EPA to help users meet the technical demands of the methods); 3) more clearly expressed the caveats and limitations of the statistical methods and approaches in the document; and 4) provided additional guidance on data requirements for application of the statistical methods and approaches. [See the response to Charge Question 5 for additional discussion.]

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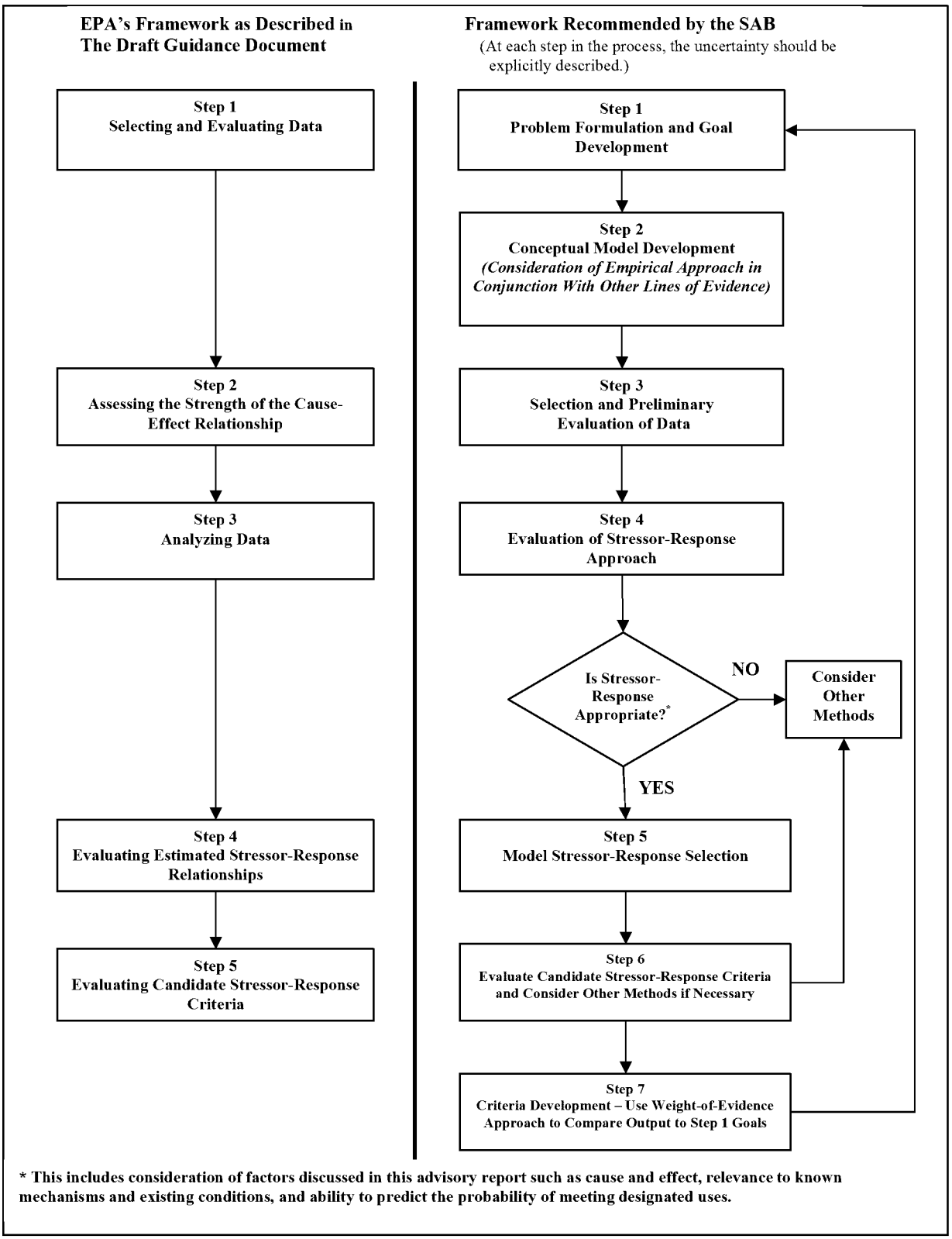

Figure 1. EPA's Framework for Developing Nutrient Criteria Based on Stressor-Response Relationships and SAB Recommendations for Revision

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- The absence of a direct causative relationship between stressor and response is one of the most serious issues raised by the Committee. Without a mechanistic understanding and a clear causative link between nutrient levels and impairment, there is no assurance that managing for particular nutrient levels will lead to the desired outcome. There are numerous empirical examples where a given nutrient level is associated with a wide range of response values due to the influence of habitat, light levels, grazer populations and other factors. If the numeric criteria are not based upon well-established causative relationships, the scientific basis of the water quality standards will be seriously undermined. [See the responses to Charge Questions 4, 5, and 7 for additional discussion.]

- Numeric nutrient concentration criteria and load-response models should be considered as two different approaches for accomplishing the goal of controlling excessive nutrient loadings. EPA has put forth the reference condition approach, the empirical stressor-response approach, and mechanistic modeling as basic analytic approaches for development of numeric nutrient criteria. However, the way in which EPA used results from mechanistic models to develop nutrient load reduction goals for the Gulf of Mexico (Mississippi River/Gulf of Mexico Watershed Nutrient Task force, 2008), and the way in which it is currently using mechanistic models for nutrient and sediment TMDLs for Chesapeake Bay, does not involve development or use of numeric nutrient criteria. The reason is that these mechanistic models (Scavia et al., 2004; Cerco and Noel, 2004) are load-response models, not empirical stressor-response models, and hence they obviate the need for numeric nutrient criteria because they directly link nutrient loads to response variables that represent water quality impairments (e.g., dissolved oxygen, chlorophyll, water clarity and acreage of submerged aquatic vegetation). This reasoning applies not only to mechanistic models but can also apply to empirical models. Turner et al. (2008) and Hagy et al. (2004) developed empirical statistical models for hypoxia in the Gulf of Mexico and Chesapeake Bay, respectively. Both of these models are load-response models and neither involves numeric nutrient concentrations. Further support for this reasoning can be found in Carleton et al. (2005), an EPA study designed to demonstrate the use of mechanistic models to develop nutrient criteria. In fact, in the two examples presented in this study, mechanistic models were actually used as load-response models and not to develop ambient nutrient concentration criteria.

Key recommendations concerning identification of the scope, limitations, and intended use of the document

As a consequence of the Committee's discussion and the findings listed above, we provide the following recommendations for revising the Guidance

1. EPA should specify how the Guidance is to be used in combination with other EPA nutrient criteria technical guidance manuals. In the preamble, the Guidance should clearly state that the contents represent one of several possible approaches (i.e., the stressor-response framework in the Guidance, mechanistic modeling, reference condition, and the application and/or modification of established nutrient/algal thresholds) that should be considered when deriving numeric nutrient criteria, and expand upon the utility

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of considering all approaches in a tiered weight-of-evidence approach before deciding on a particular course of action. In this regard, the Guidance should indicate that numeric nutrient concentration criteria and load-response models should be considered as two different approaches for accomplishing the goal of controlling excessive nutrient loadings. To provide additional information on other approaches, EPA should consider appending to the document relevant portions from earlier guidance manuals.

2. EPA should more clearly articulate how the Guidance fits within the decision-making and regulatory processes and, specifically, how it relates to and complements EPA's nutrient criteria technical guidance manuals and other EPA technical documents. Outlining the fundamental principles that underlie the use of stressor-response relationships and providing background information on water quality impairments (e.g., causes and types of impairments, types of designated uses) might provide a useful context. Including a clearer description of how water-use designations influence the derivation of empirically-derived nutrient criteria might be considered as well. Considering the number and usefulness of other EPA-developed processes and recommendations, the authors should consider how they might improve the integration of this document with other EPA efforts. For example, the Guidance would benefit by incorporating the problem formulation stage that is part of the Ecological Risk Assessment process (see Figure 1 of this advisory report).

3. In the Guidance, EPA should address the importance of: 1) establishing linkages among designated uses, measured responses, stressors, and measures of stressors; and 2) relating measures of responses directly to deleterious effects on designated uses. We agree with the statement in the Florida Department of Environmental Protection's letter of September 4, 2009 (letter from Daryll Joyner, Florida Department of Environmental Protection to Thomas Armitage, Designated Federal Officer, EPA Science Advisory Board Staff Office) indicating that the "most scientifically defensible strategy for managing nutrients within the range of uncertainty is to verify a biological response prior to taking a management action." This risk/performance-based approach to setting nutrient criteria is evident not only in Florida's program, but also in those developed by California and Maine (Florida Department of Environmental Protection, 2009; Maine Department of Department of Environmental Protection, 2009; McLaughlin and Sutula, 2007). Those risk-based linkages are not addressed in either the Guidance or EPA's Nutrient Criteria Technical Guidance documents for Rivers (U.S. EPA, 2000a), Lakes/Reservoirs (U.S. EPA, 2000b), and Estuaries (U.S. EPA, 2001).

4. In the Guidance, EPA should emphasize that the document does not address downstream effects of nutrient enrichment, which are intended to be the focus of a separate future document. Load-response models may prove useful in addressing downstream effects. The Committee has some reservations about addressing downstream effects in a separate document because fragmentation of the guidance documents will increase the likelihood that each will be used in isolation and potentially provide misleading results.

5. In the Guidance, EPA should acknowledge key factors that have appeared to limit state progress toward developing nutrient criteria. It is the Committee's understanding that

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one of the key aims of the Guidance is to accelerate State progress toward adopting numeric nutrient criteria. Because a variety of issues (such as limited availability of data and technical expertise, insufficient resources, and expense) are likely responsible for slow progress, the Guidance may not sufficiently remedy the underlying problems and therefore not facilitate state numeric nutrient criteria adoption. A more thorough exploration of the underlying reasons for slow progress would help EPA more directly address specific issues that impede progress.

Key recommendations concerning identification of the most scientifically defensible approaches to deriving numeric nutrient criteria

6. In the Guidance, EPA should recommend that users consider alternative conceptual and methodological approaches in cases where such approaches may be needed to account for complex problems associated with nutrients. The problem of eutrophication is complex, involving multiple causal variables, multiple response variables, and feedbacks among the variables (e.g., plants increase in response to nutrients then, in turn, those nutrients are provided a second time as plants decay). Moreover, response variables can be at multiple levels - primary response variables (e.g., plants), secondary response variables (e.g., dissolved oxygen [DO], pH), and tertiary response variables (e.g., fish, macroinvertebrates). A change in a response variable is unlikely to be satisfactorily described by changes in a single "causal" variable (e.g., total nitrogen [TN] or total phosphorus [TP]). The Committee suggests that developing conceptual models/diagrams (more detailed and accurate than shown in Figure 10 of the Guidance) to illustrate linkages and feedbacks between nutrients and response variables would be a useful approach to capture ecological complexity and better construct the conceptual framework.

7. In the Guidance, EPA should explicitly acknowledge the conditions under which the stressor-response relationship applies. For example, the stressor-response relationship is relatively strong and well-established in lakes and reservoirs as opposed to streams and rivers where the relationship is more complex and influenced by many factors (e.g., shading, sediment, flow regime). In cases where the relationship is not the most appropriate lens through which the problem should be viewed, the user could be directed to other approaches that might better fit the problem. Other documents referenced above (e.g., Florida nutrient guidance document) provide useful examples. The Guidance would benefit from addition of an inset "red-flag" text box that lists circumstances or system characteristics that would alert the user to the need to consider approaches other than stressor-response. This box also might caution the user about mixed systems that have been highly modified and are not easily classified. Likewise, these caveats should also include explicit recognition that the most appropriate criteria may depend upon contexts of the waterbody (e.g., shaded versus open canopy streams), as was done in Florida's guidance document. Searching for a single statewide criterion might obscure important relationships.

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8. The Committee suggests that EPA consider the following two key questions as the Agency selects variables to develop numeric criteria: 1) which measures will allow detection of impairment of designated uses? and 2) is the relationship sufficiently strong to determine a management or regulatory target (i.e., a criterion) to ensure that the designated use is protected? In certain cases, the most appropriate numeric criterion may not be a particular concentration level of a nutrient. Moreover, the stressor-response framework is but one approach for developing numeric nutrient criteria, and often it may not be the most appropriate. Because this concern cuts across all recommendations and approaches included in the Guidance, and also cuts across all charge questions, it must be addressed.

Key recommendations to increase the usability of the Guidance and reduce the likelihood of misuse

9. EPA should consider modifying the steps that provide the framework of the Guidance. The Committee suggests that the steps in the framework should be more specific and descriptive. An example is illustrated in Figure 1 of this advisory report. Two important aspects of the example in Figure 1 currently are missing from the Guidance: problem formulation/goal development and conceptual model development should be the first steps in the process, and the framework should contain an explicit step to determine whether the stressor-response relationship is appropriate.

10. EPA should revise the Guidance to include more detailed and descriptive information on the use of the statistical methods discussed in the document. In addition, EPA should provide additional support to help users meet the technical demands of the methods. The Committee finds that that the current draft of the Guidance is written for a user with considerable statistical expertise that may or may not be possessed by state water agencies. This potential mismatch has two serious potential consequences. First, the Guidance will not be helpful if it cannot be easily used by state/tribal water scientists, and second, the recommended methods could be misused and/or misapplied if not sufficiently understood by the user. As a corollary, the Guidance could specify the level of expertise needed by potential users. Correctly identifying the level of expertise of the anticipated users and providing detailed and descriptive information for them is perhaps the most critical step in the continued development and refinement of the Guidance. As part of this process, EPA needs to outline a relatively straightforward process that the users can follow to employ the methods described, and provide technical support for their use.

11. In the Guidance, EPA should more clearly express the caveats and limitations of the approaches presented. In this regard, the following issues are of greatest concern to the Committee: a) The approaches presented in the Guidance are correlative and do not demonstrate causation. b) Many water quality problems are site-specific and confounding variables likely exist. c) As further discussed in the responses to charge questions 2, 3 and 5, there are limitations associated with the retrospective approaches that are the primary focus of the Guidance, and also shortcomings associated with the multivariate techniques presented in the document. In particular, EPA should better

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identify potential confounding variables and other latent variables that may affect the response.

12. The Guidance should be revised to include additional information (i.e., technical guidance) and more examples showing when and how to use different approaches presented in the document, the advantages and limitations of each approach, the underlying assumptions and data requirements, appropriate interpretations of statistical results, and how to best parameterize the statistical models. This "how-to" information could take a number of forms, including keys, inset boxes, and appendices. Users must be given additional information that provides a clear understanding of why and under which conditions they should consider any particular approach. Related to this, the Committee recommends that the Guidance contain additional examples of the methods described in the document. Specific topics that might be included in this technical guidance include: how to modify the approaches in order to derive site-specific criteria, how to identify thresholds, use of weight-of-evidence approaches, and how to handle censored values. EPA also could include an appendix that lists other sources of assistance (e.g., Regional Technical Assistance Groups [RTAGs]), and methodological resources). Organization of the document and current section headings also could more clearly identify the steps involved in the suggested empirical approaches. It would also be helpful to incorporate case studies that apply data sets typical of what most states have. These case studies could highlight decision points in the process of criteria derivation. The use of a single case study across all the various approaches suggested in the document would be particularly helpful.

13. The document should better address data requirements (including data acquisition and data quality requirements). Without providing guidelines on data requirements, the potential for applying techniques to inappropriate or inadequate data sets is great. The Committee recommends casting this discussion in terms of data quality objectives (DQOs) and therefore suggests the following process: 1) state the problem; 2) identify the decision; 3) identify inputs to the decision; 4) define the study boundaries; 5) develop a decision rule; 6) specify tolerable limits on decision errors; and 7) optimize the design for obtaining data.

3.2. Charge Question 2. Selecting stressor and response variables

Section 1 of the draft guidance document reviews how to select the variables that appropriately quantify the stressor (i.e., excess nutrients) and the response (e.g., chlorophyll a, dissolved oxygen, or a biological index). Please comment on whether the factors to consider described in Section 1 of the draft document are appropriate for selecting response variables that are sensitive to nutrients and related to measures of designated uses.

Section 1 of the EPA Guidance reviews factors to consider when selecting stressor and response variables for empirical derivation of numeric nutrient criteria. The Committee finds that this section of the Guidance could be strengthened and recommends that EPA include additional material to address the points discussed below. Although the current version of the

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Guidance addresses some of these points, we recommend including additional examples and revisions to further develop various parts of the text as discussed below.

Findings on selecting response variables

- Although the Guidance states that response variables should be coupled to designated uses, the Committee finds that this point needs additional elaboration. Some response variables described in the Guidance are clearly related to designated uses (e.g., DO) but the linkage of other responses to designated uses is less obvious or not as well supported scientifically (e.g., macroinvertebrate species richness). Despite the importance of DO and the fact that a large number of waterbodies are impaired due to low DO concentrations, none of the examples in the Guidance include DO as a response variable. This is a significant omission that needs correcting. The Committee notes that appropriate response variables are also highly ecosystem specific. For example, chlorophyll concentrations are often more clearly related to designated uses for lakes than streams. While response variables for single taxa (e.g., salmon) may be tightly related to designated use, multimetric variables (macroinvertebrate indices, index of biotic integrity [IBI]) may be more powerful for integrating the response to nutrients at the community or ecosystem level. The Guidance would be strengthened by including more discussion relating ecosystem type and potential response variables to the designated uses (a table with some accompanying text might be an effective way to do this). [See the response to Charge Questions 3, 5, and 7 for additional discussion.]

- Conceptual model development should be required and should be incorporated early in the process of criteria development (see Figure 1 of this advisory report). Conceptual models are an important component in selection of response variables. Any stressor-response relationship used in criteria development must have ecological relevance (based on ecological understanding of the system) that can be readily explained and defended as discussed in step two in the Guidance. Conceptual models based on past empirical and experimental studies are important for identifying the mechanisms responsible for responses and effectively communicating this linkage. In the framework suggested by the Committee (Figure 1), developing the conceptual model is the second step in the process. [See the responses to Charge Questions 4 and 6 for additional discussion.]

- The Guidance would be strengthened considerably by presentation of examples illustrating a strong nutrient-response relationship and, as previously mentioned, clear linkage of the response variable to a designated use. It is important to clearly present the rationale for such linkage. Some of the examples in the Guidance illustrate relationships with very low R^2 and response variables that are not clearly related to designated use. [See the responses to Charge Questions 3, 5, 6, and 7 for additional discussion.]

- In the Guidance, further discussion of potential response variables appropriate for nutrient effects on detritus-based systems is warranted (e.g., how macroinvertebrate populations dependent on detritus may respond). The Guidance focuses on nutrient-response relationships driven by autotrophic processes (nutrients directly control algal growth, excessive amounts of which impair systems through indirect effects on DO, food web

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changes, and aesthetics). However, nutrients can also directly control heterotrophic microbes (bacteria, fungi) and indirectly control decomposition of organic matter. Excessive nutrient levels could produce large microbial growths or alter food webs in detritus-based ecosystems (e.g., many streams). Studies in the literature are cited, but examples using relevant response variables (e.g., shredder macroinvertebrate biomass, leaf breakdown rate) would be useful.

Findings on stressor and related variables

- In the Guidance, more discussion is needed to outline and provide advice on the rationale for selecting variables that should be included in data collection to allow: 1) classification/stratification of data prior to evaluation of stressor-response relationships (e.g., development of different criteria for different strata of systems); and 2) use of multivariate approaches to separate the influence of nutrients from other stressors (e.g., sediments, light regime, toxics). Stratification/classification is a particularly important issue for defining nutrient stressor-response relationships for streams where other factors can impose significant constraints on the effects of excess nutrients on designated uses. For example, nutrient-chlorophyll relationships may not be observed in highly shaded (forested) streams, but may be significant in open-canopy streams. Similarly, nutrient-chlorophyll relationships may be weak in high gradient streams but much stronger in low-gradient streams. For lakes, nutrient-chlorophyll relationships may be much different for highly-colored (high dissolved organic carbon [DOC]) versus clear (low DOC) systems. [See the responses to Charge Questions 3 and 5 for additional discussion.]

- Single variable stressor-response relationships (e.g., those derived using the simple linear regression approach discussed in the Guidance) that explain a substantial amount of variation are likely to be uncommon for most aquatic ecosystems (in particular, streams). Multivariate approaches (multiple regression, structural equation modeling [SEM], etc.) may be needed to identify nutrient effects. These approaches require data on other potential stressors or constraining variables. Multivariate approaches may also be useful early in the analysis to determine whether nutrient effects are significant relative to other stressors and constraints and whether/how to pursue the nutrient effects using simple univariate regressions, perhaps after stratification of systems. [See the response to Charge Question 5 for additional discussion.]

- The Guidance focuses primarily on TN and TP as the primary nutrient stressor variables. In systems where inorganic nutrients are the dominant form, some consideration should be given to inorganic N and inorganic P. It is easier to measure the inorganic forms of N and P and more and/or better data may be available for these forms. This is particularly true for ammonium and nitrate versus TN, but perhaps less so for P.

- In many regions N and P are often co-limiting to plants and microbes and stressor-response relationships based on only one nutrient are weak. Nevertheless, nutrients (N and P) may be the primary factor controlling productivity/biomass. There have been several recent papers arguing for management of N and P in combination rather than singularly (Lewis and Wurtsbaugh, 2008; Conley et al., 2009; Paerl, 2009). This would suggest development of

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multivariate stressor-response relationships (e.g., multiple regression) that include both N and P as independent variables.

- A basic conceptual problem concerning selection of nutrient concentrations as stressor variables (as illustrated in the Guidance) is that nutrient concentrations directly control only point-in-time, point-in-space kinetics, not peak or standing stock plant biomass. Plant biomass is driven by nutrient supply rates (i.e., nutrient mass loads). Ambient nutrient concentrations are not necessarily good surrogates for nutrient mass loads. Relationships between nutrient mass loads and ambient nutrient concentrations are highly system-specific and depend on many factors including inflows, hydrology, bathymetry, sediment-water exchanges and chemical-biological processes. Consequently, there may be many systems for which nutrient concentrations will not be appropriate stressor variables. For such systems it may be more appropriate, and scientifically defensible, to use site-specific mechanistic models incorporating loading to determine the nutrient controls required to attain designated uses.

Findings on temporal/spatial aspects of data

- The Guidance provides little discussion regarding the temporal/spatial aspects of data needed to develop relevant stressor-response relationships. For example, the document could be strengthened by providing additional material to address the following questions. "Under what conditions might the use of mean/median or maximum/minimum values of stressor and response variables be more appropriate than discrete instantaneous measurements?" "Are there instances when the use of temporally out-of-phase stressor and response data are most appropriate (e.g., the widely recognized relationship between spring nutrient concentration and summer maximum chlorophyll concentration in lakes)?" "How can time series or longitudinal data in specific systems be used to develop more generalized stressor-response relationships?" Although such guidance may be covered in the various system specific technical manuals (U.S. EPA, 2000a, 2000b, 2001), a summary/synthesis of the major points of these earlier documents should be included in the empirical approaches document.

- The Guidance could be strengthened by including a discussion of the importance of considering "data bias" in interpreting the stressor-response relationships. This discussion should focus on how "data bias" (i.e., limits on data representativeness) might affect predictive performance and uncertainty in stressor-response relationships. Uncertainty imposed by model assumptions should also be discussed. Specifically, additional guidance is needed with regard to interpretation of data from particular environments (e.g., a set of lake data from a particular region) and its appropriateness (or lack thereof) for describing conditions more broadly. It would be helpful to include in the Guidance examples illustrating databases that would be "ideal" or appropriate for each empirical model presented. For example, information could be provided to indicate whether a conceptual model for considering nutrient criteria might be best approached using: seasonal data; data from shaded versus unshaded streams; data from wadeable streams versus big rivers; and/or long versus short term averages of data describing the stressor or the response. [See the response to Charge Question 6 for additional discussion.]

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- It would be useful to include in the Guidance some discussion of how nutrient recycling and other feedbacks influence stressor-response relationships. For example, the Guidance could be strengthened by addressing the following questions. "How does recycling contribute to variability and uncertainty in stressor-response relationships?" "Are there variables that can be used in stressor-response relationships to account for recycling?"

Key recommendations concerning selection of variables to appropriately quantify the stressor and response

The Committee provides the following key recommendations to address the findings above and strengthen Section 1 of the Guidance.

1. The Guidance should be revised to elaborate upon the coupling of response variables to designated uses and the importance of ecological relevance of the stressor-response relationship. Examples should be included to further illustrate this important point. The examples should show strong nutrient-response relationships. The Guidance should be revised to include at least one example for DO as a response variable. Ideally, each method should include an example for streams/rivers and an example for lakes. If empirical stressor-response relationships are not appropriate or workable for DO in lakes, then the Guidance should state this specifically and recommend other approaches, for example, site-specific mechanistic models. There are a large number of waterbodies that are impaired by low DO and the draft Guidance is silent on this important nutrient-related problem.

2. The Guidance should be revised to include discussion of potential response variables appropriate for assessing nutrient effects on detritus-based systems.

3. The Guidance should be revised to include more discussion and advice concerning selection of variables and data needed to allow:

    - Classification/stratification of data prior to evaluation of stressor-response relationships (e.g., development of different criteria for different strata of systems).

    - Use of multivariate approaches to separate the influence of nutrients from other stressors (e.g., sediments, light regime, toxics). In general, the importance of multivariate stressor-response relationships and tools for multivariate approaches should be further discussed in the final Guidance.

4. In systems where inorganic nutrients are the dominant form, the Guidance should recommend considering inorganic N and P as nutrient stressor variables.

5. The basic conceptual problem associated with selecting nutrient concentrations as stressor variables should be addressed in the Guidance (i.e., nutrient concentrations directly control only point-in-time, point-in-space kinetics, not peak or standing stock plant biomass).

6. The Guidance should be revised to include discussion of:

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- The temporal/spatial aspects of data needed to develop relevant stressor-response relationships. (e.g., are there instances when the use of temporally out-of-phase stressor and response data are most appropriate?)

- How "data bias" (e.g., data from different types of systems) might affect predictive performance and uncertainty in stressor-response relationships.

- How nutrient recycling and other feedbacks influence stressor-response relationships.

3.3. Charge Question 3. Approaches to demonstrate the distribution of and relationships among variables

Section 1 outlines methods to visualize available data. Please comment on the effectiveness of the following approaches described in the document (listed below) to demonstrate the distribution of and relationships among variables.

a) Basic data visualization techniques
b) Maps
c) Conditional probability
d) Classifications

Section 1 of EPA's Guidance discusses exploratory data analysis and presents several methods for demonstrating the distribution of and relationships among variables. Several basic plotting techniques are presented in Subsections 1.2 – 1.6 of the document. This is followed by a description of conditional probability analysis (a statistical approach for summarizing how changes in nutrient concentrations are associated with the probability of waterbodies attaining their designated uses). The Committee was asked to comment on the effectiveness of the methods presented in this section of the Guidance.

The Committee notes that the response to Charge Question 3 necessarily overlaps with responses to other charge questions, particularly those that focus on identifying stressor-response relationships and conducting statistical analyses. We emphasize that visualization of data is of secondary importance if the data and statistical methods being visualized are inappropriate, because the visualization in itself suggests authenticity. Furthermore, the exploratory data analysis, including visualization, should be conducted prior to inferential statistical analyses of potential stressors and responses. The objectives of exploratory data analysis should be to better understand the system of interest and to maximize the accuracy and minimize the variability of the subsequent stressor-response relationships. The Committee finds that discussion of exploratory data analysis in the Guidance would be more effective if the document were reorganized and expanded to address the following points.

- <u>The Guidance would be more effective if exploratory data analysis were included by itself in a separate section of the document following a major section on problem formulation</u> (corresponding to the Framework in Figure 1 of this advisory report).

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- Additional methods for exploratory data analysis should be described in the Guidance. These additional methods should include: the use of summary statistics; time series plots at fixed points in space; longitudinal plots at fixed points in time; bubble plots; Pearson and other types of non-parametric correlation analyses; and maps that show temporal (monthly, seasonal, inter-annual) as well as spatial patterns.

- Clear guidance is needed for identifying when and how the statistical methods and visualization techniques should be used. The strengths and limitations of the methods should also be identified. It would be useful to show several case examples that range from state-wide to local and data-rich to data-poor, and exemplify different types of aquatic ecosystems (e.g., headwater streams, large rivers, lakes and estuaries). Examples should note the strengths, limitations, assumptions and uncertainties that must be considered when using the methods to explore and visualize the data, and subsequently develop the criteria. These examples should demonstrate how nutrients can be identified as significant stressors when multiple stressors and habitat factors are present and may affect the resident communities. [See the response to Charge Question 5 for additional discussion.]

- The discussion in Subsection 1.6 of the Guidance (examination of stressor-response distributions across different classes, e.g., ecoregions) should be expanded. The subsection should discuss additional data analysis and contain examples for different spatial classifications (e.g., ecoregions, states, watersheds, systems of interest), different waterbody types (e.g., streams, rivers, lakes, estuaries) and other important physical and chemical characteristics that could affect the applicability of the nutrient criteria. [See the response to Charge Questions 2 and 5 for additional discussion.]

- The examples provided in the Guidance generally do not demonstrate a strong nutrient stressor linkage to beneficial use impairment. The stream examples show very weak correlations that have high levels of uncertainty and the examples lump data from distinctly different ecosystems where multiple factors in addition to nutrients will contribute to biotic responses. [See the responses to Charge Questions 5, 6, and 7 for additional discussion.]

- All of the statistical and visualization methods discussed in Subsections 1.2 -1.6 of the Guidance can be effective but they should be presented and used in a combined, weight-of-evidence approach because they each involve exploring the data in different ways. [See the responses to Charge Questions 1, 3, 5, and 7 for additional discussion of weight-of-evidence.]

- The Committee emphasizes the importance of choosing the biological endpoints (i.e., response variables) that respond specifically to nutrients. We note that responses of benthic indices can be related to many types of stress. We question why periphyton would not be a better receptor to measure.

- The Committee suggests that field-based species sensitivity distributions (SSDs) may be useful for nutrient criteria development. We note that SSDs have been used effectively in recent publications for establishing guidelines (or refuting them) for contaminants, temperature, and salinity (Hickey, 2008; Leung et al., 2005).

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The Committee also notes the following technical edits and corrections needed in the Guidance.

a. Clarify that macroinvertebrate richness is plotted in examples in Subsection 1.3.
b. The Guidance (p. 7) states that "variables are equally weighted" yet only one variable is plotted in each box plot. A better statement would be: "One limitation for box plots is that all of the samples are equally weighted."
c. Explain probability survey design and data smoothers or provide references.
d. Figure 7 is very confusing to those unfamiliar with scatterplot matrices; some additional explanation regarding how to "read" the horizontal and vertical axes of each graph in the matrix would help. Suggested wording: "For each scatterplot, its x-axis is the variable stated in the column in which the graph appears. Its y-axis is the variable stated in the row in which the graph appears."

Key recommendations regarding methods for demonstrating the distribution of and relationships among variables

As discussed above, the Committee recommends that EPA restructure and revise the Guidance to strengthen discussion of methods for demonstrating the distribution of and relationships among variables. The following key recommendations are provided.

1. The Committee recommends that the Guidance be clarified by reframing Subsections 1.2 through 1.6 as a separate major section on exploratory data analysis. These subsections should follow another separate major section on problem formulation (see Figure 1 of this advisory report), and the material in Subsection 1.1 (selecting stressor and response variables) should be moved to later section(s) of the document.

2. The Guidance should be revised to include additional methods for exploratory data analysis. These additional methods should include: the use of summary statistics; time series plots at fixed points in space; longitudinal plots at fixed points in time; bubble plots; Pearson and non-parametric correlation analyses; and maps that show temporal (monthly, seasonal, inter-annual) as well as spatial patterns.

3. Subsection 1.6 of the Guidance should be expanded to include additional examples of different spatial classifications. Specifically, the classification subsection of the Guidance (Subsection 1.6) should be expanded with data analysis examples for different spatial classifications (e.g., ecoregions, states, watersheds, systems of interest), different waterbody types (e.g., streams, rivers, lakes, estuaries) and other important characteristics that will affect the applicability of the nutrient criteria. These characteristics could include, but should not be limited to, stream order, flow, velocity, canopy cover, dissolved oxygen, reference condition trophic status, channel width and depth.

4. The Guidance should be revised to clarify, early in the document, that there are many useful statistical and visualization methods that are not presented and which may be useful. The more common/well accepted methods could be listed in a table with references. It may also be useful to mention methods that are inappropriate. With each

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method the associated strengths, limitations, assumptions and uncertainties should be noted to better guide the user.

5. Several case examples of exploratory data analysis should be included in the Guidance. These examples should illustrate cases ranging from national to local in scope, and data-rich to data-poor, with guidance on how best to explore and visualize the data.

6. The Guidance should contain additional information concerning statistical assumptions associated with various methods. Some guidance should be presented, as in other EPA documents (e.g., U.S. EPA, 2006a; U.S. EPA, 2006b), to address the importance of ensuring that statistical assumptions are not violated and that adequately trained statisticians, in concert with experienced aquatic ecologists and environmental modelers, evaluate the data. An example could be included to show how overly simplistic statistical analysis could not identify a relationship that became evident after complex/advanced analysis. The Committee notes that CProb 1.0, EPA's tool for conditional probability analysis was developed with the R language and environment for statistical computing. The Committee questions whether R, an open-source freeware product that is becoming very popular, is completely acceptable, in the sense that there are many R-macros in use that remain to be properly "vetted." There should be some level of assurance that the recommended R-products have been properly vetted (e.g., CProb 1.0).

7. The Guidance should contain a quantitatively based weight-of-evidence framework using multiple methods and then combining them into figures and tables for visualization. Multiple statistical methods on one data set do not equate to a reasonable weight-of-evidence that significantly reduces uncertainty. Rather, the weight-of-evidence should involve different assessment methods (e.g., different data sets, different biological endpoints, measures of habitat, etc.). This premise has been embraced by other EPA programs and the scientific community (Adams, 2003; Burton et al. 2002; Chapman, 2007; Chapman et al., 2002; Collier, 2003; Cormier et al., 2010; Fox, 1991; Linder et al., 2010; Linkov et al., 2009; Suter et al., 2002; Suter et al., 2010; U.S. EPA, 2000c; Weed, 2005; Wickwire and Menzie, 2010).

8. The Guidance should contain a discussion of how the stressor/response variables to be used are linked to one another in space and time for further analysis. There is no mention of this in Subsection 1.1 of the Guidance. The Committee questions whether it should be assumed that stressor/response measurements always occur at the exact same time and locations. It is also important to ensure that high flow events have been measured. It is well established that most nutrient loading occurs during high flows. Therefore, the influence of seasonality and smaller-scale temporal dynamics (e.g., storm events) and the importance of linking stressor and response variables with these factors should be at least noted in the Guidance.

9. The Guidance should discuss the use of modeled data (e.g., land use characterization, hydrology, surface runoff, receiving water quality) for estimating nutrient concentrations/exposures. The pros and cons associated with the use of such data should

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be briefly mentioned. There are a number of EPA-supported models that have been widely used and documented in recent years (e.g., HSPF, BASINS, QUAL2K, WASP, AQUATOX, and Chesapeake Bay WQSTM). Some of these are integrated watershed models designed to represent inflows and non-point source runoff loads. Typically, they are used as a "loading engine" for a receiving water quality model. Receiving water quality models describe load-response relationships for exposures (ambient nutrient concentrations) and effects (e.g., plant biomass, zooplankton, dissolved oxygen), and response parameters that represent use impairment. Some receiving water quality models can address multiple stressors. For example, they can include N, P and silicon as potentially limiting nutrients, sediment (suspended solids) and its influence on underwater light attenuation, incident solar radiation, temperature, and grazing pressure. It is possible to use these water quality models to describe exposure (in terms of ambient nutrient concentrations) but in the absence of empirical data, this would not be scientifically defensible.

10. The Committee recommends that EPA re-evaluate many of the figures in the Guidance (e.g., 4-8, 13-16, 21, 25, and 26). These figures show widely varying data that demonstrate weak relationships.

11. The Committee recommends that the Guidance be revised to clearly indicate the statistical assumptions and uncertainties that should be taken into consideration when using methods described in the document. Some of the methods are complex and their descriptions lack transparency. Guidance should be provided to ensure that states and other users have an understanding of the data requirements and limitations, the associated statistical assumptions, and uncertainties.

12. The document should contain a discussion of ways to examine the independent and interactive effects of the variables to be considered in deriving numeric nutrient criteria (i.e., provide a menu of options to examine independent and interactive effects). Statistically, there are several well known ways to address additional contributing variables, such as total suspended solids (TSS). One way would be to use a multiple regression model or analysis of covariance (ANCOVA). This would be a valuable approach, as the additional variables are to be treated as continuous variables, and interaction terms could be added to see if the effects of TN/TP were dependent on levels of TSS, which would be expected, particularly for TP. If one treats the additional variables as factors then an analysis of covariance (ANCOVA) model would be most appropriate. For example, if there were a TSS threshold of interest, a relationship could be established between an invertebrate endpoint and nutrient levels above and below a critical TSS threshold. This would allow one to examine independent and interactive effects.

13. The Guidance should mention the potential benefits of using proxy variables in an initial approach for exploratory analysis of data trends. For example, variable data sets that are easier and more practical to obtain, such as more generic point/nonpoint source loadings or commonly sampled stressor/response variables, might be used as proxy variables for exploratory analysis of data trends. This is briefly mentioned in Subsection 3.1 of the

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Guidance (auxiliary model), but such an approach could also be useful for selecting stressor/response variables early in the process (Section 1).

3.4. Charge Question 4. Methods for assessing the strength of the cause-effect relationship

Section 2 of the draft guidance document describes methods for assessing the strength of the cause-effect relationship represented in the stressor-response linkage. Please comment on whether the draft guidance document adequately describes how conceptual models, existing literature, and empirical models can be used to assess how changes in nutrient concentration are likely to cause changes in the chosen response variable.

Section 2 of the Guidance provides a summary of how the strength of tentative stressor-response pairings from step 1 can be assessed. Certainly, as indicated in the Guidance, conceptual models and existing literature can be used to support relationships that will be explored with the statistical analysis that follows. At this stage of the analysis, stressor-response relationships for which there is no reasonable conceptual model or literature to explain the underlying mechanisms would be of limited value for setting criteria. Such relationships should be set aside. The Committee finds that the Guidance should be improved by incorporating revisions to address the following points.

- Section 2 of the Guidance does not address the strength of the stressor-response relationship, but rather support for the stressor-response relationship that is to be explored statistically. "Support" for the stressor-response relationship, rather than "strength" of the relationship, would be a better term to use in this section of the Guidance, because strength refers to the "tightness" of the statistical association between stressor and response. Use of the term "support" would, therefore, be less confusing to the user.

- It is not clear why information from mechanistic models was not included in Section 2 of the Guidance. Because mechanistic models can integrate information on the interactions of major ecosystem processes to derive quantitative estimates of effects, they too should be discussed as a possible way of supporting the stressor-response relationship. [See the response to Charge Question 1 for additional discussion.]

- Additional discussion of conceptual model selection (with specific examples) would be helpful. There are many ways to select a conceptual model and various model selection criteria that could be applied. An expanded discussion of these issues could help provide further background for a user of the document. Specific examples could be followed in later sections with discussion of statistical approaches to analyze the strength of the potential cause-effect relationships. In other words, EPA could provide an example from beginning to end that a user could follow from step to step. [See the response to Charge Questions 1, 2, and 6 for additional discussion.]

- One important aspect of finding support for stressor-response pairings is that without formal training and practical experience in the sciences, especially biological and ecological

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disciplines, it is difficult to fully understand the complex relationships that may be identified. The Guidance should state the level of statistical and ecological expertise needed to use the document. [See the response to Charge Question 1 for additional discussion.]

- Structural equation modeling (SEM) and Propensity Score Analysis (PSA) are techniques that can be used to organize and evaluate relationships between nutrients and response variables when extensive data are available. SEM might be more useful in tracing pathways (it is also called path analysis) of cascades that are initiated by excess nutrients than in defining criteria candidates. A relevant example of SEM is really needed in the Guidance if this approach is to be considered by users. PSA, on the other hand, seems to be useful for sorting out groups that share covariates but may have unique nutrient characteristics. Such sorting could lead to a clearer understanding of how nutrients function amid multiple covariates. The example of PSA in the Guidance appendix is helpful, but further explanation of how to interpret the results of the analysis is needed. An analysis such as PSA might really belong in a later section of the document, as it is used for data analysis rather than supporting potential relationships.

- A reasonable way to assess nutrient effects might be to split data sets (through PSA, principal components analysis, and/or cluster analysis) to enable a system-specific analysis (or analysis of a small groups of sites). Given the many factors that affect streams and rivers, system-specific analysis really provides an assessment of whether altering nutrient concentrations would have the desired effect on the biotic communities present. Possible factors to consider in splitting data for streams and rivers might include, for example, stream order, flow, velocity, canopy cover, dissolved oxygen, bottom type, channel width, habitat, and depth. [See the responses to Charge Questions 2 and 5 for additional discussion.]

- Experimental validation of causal relationships between nutrient and response variables should be approached with caution. The final method discussed on page 17 of the Guidance is experimental validation of causal relationships between selected nutrients and response variables. The Committee notes that this approach could be helpful *in situ* and there are examples of this (Benstead et al., 2009; Cross et al., 2006; Cross et al., 2007; Greenwood et al., 2007; Peterson et al., 1985; Slavik et al., 2004; Stockner and Shortreed, 1978), but mesocosm or laboratory experiments are of limited use in validating causal relationships between nutrient and response variables. For example, Hill and Fanta (2008) and Hill et al. (2009) showed in Oak Ridge National Laboratory artificial streams how P and light interact. This type of work provides fundamental data on how stream algae respond to P and light, and supports basic conceptual models of this relationship. These and previous studies have shown that, under controlled conditions it takes very little P to maximize algal growth given high light and this fundamental relationship could be applied to any stream in the U.S. However, the relationship is often not observed in data sets because other factors such as bottom substrate, turbidity, canopy cover, hydrology, or depth limit algal production. Therefore, caution must be used in applying a relationship from a subset of data to all data from systems that do not have the same or similar conditions. [See the response to Charge Question 6 for additional discussion of model validation.]

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Key recommendations concerning methods for assessing the strength of the cause-effect relationship represented in the stressor-response linkage

In light of the comments and findings discussed above, the Committee provides the following key recommendations to improve Section 2 of the guidance.

1. Section 2 of the Guidance would be more appropriately titled "Assessing Support for the Potential Cause-Effect Relationship."

2. Mechanistic models should be discussed in the Guidance as one way of supporting the stressor-response relationship.

3. The discussion of conceptual models should be expanded to address various criteria for model selection, and additional examples should be included.

4. The level of statistical and ecological expertise needed to use the Guidance should be stated.

5. Structural Equation Modeling (SEM), offered as an alternative model for exploring nutrient-ecosystem response, should be more fully explained with clear examples.

6. Further explanation of how to interpret the results of propensity score analysis (and additional examples) should be included in the Guidance.

7. Experimental validation of causal relationships between nutrient and response variables should be approached with caution because a number of factors can affect the response of a system to nutrient enrichment.

3.5. Charge Question 5. Statistical methods to analyze the data

Section 3 of the draft guidance document outlines statistical methods to analyze the data to estimate stressor-response relationships. Please comment on the appropriateness of the methods outlined in the document (listed below) for describing stressor-response relationships associated with nutrient pollution. What approaches would you recommend that could effectively address indirect pathways of adverse effects? What recommendations do you have to address the effects of confounding variables and uncertainty in the estimated relationships?

a) Simple linear regression
b) Quantile regression
c) Logistic regression
d) Multiple linear regression
e) Non-parametric changepoint analysis
f) Discontinuous regression models

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The Committee notes that EPA's draft Guidance appropriately states that numeric nutrient criteria should be based on predictive stressor-response relationships so that changes in the level of stressor variables will result in predictable ecosystem responses. However, based on examples presented in the draft document and elsewhere, a large degree of unexplained variation can be encountered when attempting to use empirical stressor-response approaches to establish criteria. The final Guidance needs to clearly indicate that such unexplained variation can present a significant problem to this method of developing numeric criteria. Further, the final document should emphasize that statistical associations may not be biologically relevant and do not prove cause and effect. However, when properly determined, statistical associations can be very useful in supporting a cause and effect argument as part of a weight-of-evidence approach to criteria development. To this end, the final document should provide greater detail on the implementation of statistical procedures and development of other supporting information to minimize the degree of unexplained variation and maximize the potential for the empirical stressor-response approach to result in useful numeric nutrient criteria. EPA should also provide guidance on the strength of stressor-response relationships needed to support criteria development using an empirical stressor-response approach. Further, because nutrients are essential elements, the application of statistical methods must consider both nutrient deficiency and excess. Clear links between response variables and designated uses are needed to ensure that both of these possible impairment types are addressed. The Committee provides the following findings and comments concerning the appropriateness of statistical methods in the Guidance, approaches to address indirect pathways of adverse effects, and ways to address the effects of confounding variables and uncertainty in the estimated relationships.

Findings on appropriateness of listed statistical methods

- The Guidance represents a substantial step forward in describing statistical methods that can be used in deriving nutrient criteria based on stressor-response relationships, but more information is needed to describe supporting analyses necessary for application of the methods. The six methods identified in the Guidance generally provide appropriate options for describing stressor-response relationships that may be sufficiently predictive to support setting numeric nutrient criteria. As many examples in the draft document illustrate, there is likely to be considerable variability in stressor-response nutrient relationships and, thus, in the predicted outcome or response to both target setting and response to mitigation efforts. Therefore, the document must provide more information on the supporting analyses needed for each method to correctly identify useful predictive relationships, and acknowledge that the use of these statistical methods alone cannot provide sufficient evidence of a cause-effect relationship. [See the response to Charge Question 1 for additional discussion.]

- The use of non-parametric change point analysis and discontinuous regression analysis must be associated with biological significance and the designated uses to be protected by numeric nutrient criteria. As stated previously, response variables must be associated with designated uses in all cases. This has implications for the use of non-parametric change point analysis (nCPA) and discontinuous regression in criteria development. The Guidance indicates that, because these procedures may identify breakpoints in nutrient responses that can serve as criteria thresholds, the methods may be used when designated use thresholds are not

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available. However, although these methods may be able to identify and characterize breakpoints, such breakpoints may not necessarily have any biological significance, nor will they necessarily be related to designated uses that are to be protected by numeric nutrient criteria. Use of these methods must be associated with designated uses. [See the responses to Charge Questions 1, 3, 6, and 7 for additional discussion of the importance of biological significance and linkages to designated uses.]

- The statistical methods in the Guidance require careful consideration of confounding variables before being used as predictive tools. For example, the appropriate use of bivariate regression methods requires additional efforts through classification or other means to minimize the influence of other potential causal variables so that an acceptable level of confidence in the predictive power of the relationship can be achieved. Without such information, nutrient criteria developed using bivariate methods may be highly inaccurate. Multiple linear regression is an appropriate way to incorporate covariates into a single analysis, although predictive power using this procedure must also be evaluated carefully. [See the responses to Charge Questions 1, 2, 3, and 4 for additional discussion.]

- As previously noted, because plant biomass is driven by nutrient supply rates (mass loads), a potential conceptual problem exists with the selection of nutrient concentration (often used in the Guidance) as a stressor variable. This problem illustrates the importance of careful characterization of confounding variables. Nutrient concentrations control only point-in-time, point-in-space kinetic rates, not peak or standing stock plant biomass. Plant biomass is driven by nutrient supply rates (mass loads). Furthermore, nutrient concentrations may not be direct surrogates for nutrient mass loads. Relationships between nutrient mass loads and ambient nutrient concentrations are highly system-specific and depend on many factors. Consequently, in some circumstances, statistical methods alone will not adequately account for the influence of confounding variables and reduce uncertainties. In other words, the Committee anticipates situations in which stressor-response statistical analysis may not lead to a scientifically justified endpoint. [See the responses to Charge Questions 1 and 2 for additional discussion.]

- In order to be scientifically defensible, empirical methods must take into consideration the influence of other variables. On page 22 of the Guidance, the authors acknowledge that factors co-varying with TP concentrations may explain a portion of the 61% of the variation in log chlorophyll a concentrations apparently attributable to log TP concentrations. This presents a critical challenge in the use of empirical methods as a means of establishing numeric nutrient criteria because it means that controlling TP concentrations may have no potential to yield reductions in chlorophyll a concentrations. Thus, in order to be scientifically defensible, empirical methods must take into consideration the influence of other variables.

- It is important to discuss strength-of-relationship concerns and how results of empirical approaches should be interpreted in the context of criteria development. Figure 13 on page 24 of the Guidance provides an illustration of the challenges facing the users of simple linear regression (SLR) and other empirical approaches. In this case, total macroinvertebrate species richness was regressed against total N concentrations obtained from EPA

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Environmental Monitoring and Assessment Program (EMAP) West Xeric Region streams. Overall, total species richness declines with increasing TN concentration in these stream data. Applying SLR to log-transformed data yields a statistically significant slope -3(log(TN)) at $p<0.001$. However, a large degree of scatter remains, as indicated by the R^2 value of 0.19. A TN "candidate criterion" of 320 ug/L is obtained by finding the point of intersection of an assumed designated use total species richness threshold of 40 and the mean regression line log(TN) = ~ 2.5. Unfortunately, the points where the lower and upper 90% prediction interval lines cross a species richness threshold of 40 cover a TN concentration range from about log(TN) = 1.25 to log(TN) = 4 based on inspection of Figure 13. This corresponds to a TN concentration range of 16 ug/L to 10,000 ug/L. It is important to understand the management consequences of this considerable uncertainty. Also, the fact that the relationship in Figure 13 is both statistically significant (i.e., some trend is evident) and has a low $R^2 = 0.19$ (much scatter also exists) presents an opportunity to discuss strength-of-relationship concerns and how such results should be interpreted in the context of criteria development. [See the responses to Charge Questions 1, 2, and 6 for additional discussion.]

- As previously discussed, relationships for streams may be more complex than for lakes and must account for multiple stressors/conditions and/or stream 'types' or conditions, and then be applied appropriately. For example, a stratified approach that considers attributes known to be important for a particular environment (lake, stream, estuary) such as canopy, habitat, etc., should be considered. It is also important to deal with both N and P simultaneously and to consider inorganic N and dissolved P. An exercise in Section 3 of the Guidance illustrates the relationship between chlorophyll a and TP in lake water. This is perhaps the easiest and most well known example of stressor-response in natural waters, and specifically in lakes. This relationship is less certain in streams because they are more heterogeneous than lakes. The Guidance also inappropriately assumes that only nutrients affect taxa. The functionality of aquatic food chains is not solely dependent on one type of biota, sediment type, or single nutrient concentration. There are multiple stressors affecting receptors in a number of ways, over the landscape and watershed in question. Confounding variables are not sufficiently addressed in the Guidance. As previously discussed, approaches that address multiple factors, such as a stratified (or hierarchical) approach that considers other attributes known to be important (e.g., canopy, habitat, multiple nutrients) should be considered. [See the responses to Charge Questions 1, 2, and 3 for additional discussion.]

- The Guidance could be improved by replacing many examples that provide low explanatory power. Concerns include examples with very low R^2 indicating low explanatory power and incomplete description of large uncertainty. These examples indicate that variables other than TP or TN have a greater impact on response, which implies that reducing TP or TN may not have the desired effect. Helpful examples could include: one with a response variable indirectly associated with a designated use; and one from a state where a Secchi depth is used as a criterion for water quality (otherwise Subsection 3.1, paragraph 2 sounds extremely vague). [See the responses to Charge Questions 1 and 3 for additional discussion.]

- Parametric (e.g., Pearson) and non-parametric (e.g., Spearman's rank, Kendall's tau) correlation analyses can assist in identifying the influence of confounding variables, but these

methods are not specifically mentioned in the Guidance. Both of these types of analyses would be helpful in exploratory data analysis.

- The Guidance lacks sufficient discussion of the importance of variable selection and data characteristics to ensure useful implementation of the statistical procedures. In addition to its incomplete treatment of confounding variables, the Guidance lacks sufficient discussion of the importance of variable selection and data characteristics to ensure useful implementation of the statistical procedures. Many of the non-parametric procedures rely upon bootstrap procedures to obtain confidence intervals. This underscores the importance of using a probability sampling procedure. The implications of different sample sizes should also be more fully discussed. The Guidance states that an advantage of using quantile regression (QR) is that it can provide direct estimates of percentiles of a distribution of Y values at given X values, which may be better estimates of these values than provided by SLR when the assumptions of SLR are not met. Uncertainty associated with estimating extreme quantiles from "small" sample sizes is appropriately identified in the Guidance as a concern for QR. However, small sample size is likely to present considerable challenges to any nutrient criteria development approach, and the Guidance should provide a discussion of how the amount of data may affect the utility of empirical stressor-response approaches.

- In the Guidance, more information must be provided regarding regression assumptions, limitations, and diagnostic procedures. Although the Guidance should not be expected to provide the same level of detail on the implementation of statistical procedures contained in a statistics textbook, more information must be provided regarding regression assumptions, limitations, and diagnostic procedures. The appropriateness of the regression methods will depend on the assumptions and use restrictions of each method. Although the document discusses many of the important assumptions, it would be helpful for this information to be clearly summarized in a table. The table could include headings for each method such as use, inherent assumptions, and specific remarks. In addition, the importance of regression diagnostic procedures should be emphasized. Examples and specific references to additional sources of information should be provided. This could include evaluating data with and without outliers or unusual values.

- More guidance is needed on the interpretation of results from the listed regression procedures. For example, how does one decide whether the results of quantile regression are adequate for criterion development? In the discussion of logistic regression (p. 28, last paragraph), nothing is said about whether the coefficients in this analysis are significantly different from zero, or about the proportion of total deviance accounted for by the regression. For multiple linear regression (p. 31) a reference (e.g., Kutner et al., 2004) is needed for Akaike and the other methods listed in the third paragraph of the page.

- The role of, and options for, data transformations should receive considerably more discussion in the Guidance. Data transformation may be appropriate in the development of stressor-response relationships using regression analysis, but this topic (including the associated back-transformation of slope estimates and confidence intervals to yield criteria) should be more carefully developed. In reading the document, one wonders when the log-transformation should be used to establish linear relationships or whether curvature that may

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be present in raw data (with no transformation) should be characterized. In addition, the document does not describe the range of data transformations that may be appropriate, instead focusing only on the log-transformation. For example, regarding the nCPA presented in Figure 24, would the analysis give the same result if it were based on TP data that were not log transformed? It is not clear in the Guidance when to apply a linear method to transformed data or a changepoint or discontinuous regression method to untransformed data. As a start, a table like Table 6.5, "Linearizing Transformations" in Weisberg (1985), p. 142 could be included in the Guidance, along with some explanation. Finally, "back-transformation" has the potential to introduce bias into the criterion value if done incorrectly, and this topic should be treated more completely to minimize that potential.

- The Guidance appropriately points out that regression relationships should generally not be used to project conditions beyond the range of conditions used to develop the relationships.

- The Guidance is silent on how and when the results of multiple statistical procedures may be integrated to support numeric criteria as an alternative to selecting "the best" model in situations where a clearly preferred model does not emerge from the analysis. Rather than presenting the statistical techniques strictly as alternatives, the document could describe how these procedures can complement each other and provide a more robust picture of what an appropriate criterion should be. For example, a linear regression whose residuals appear to show the presence of curvature might also be evaluated with nCPA to evaluate the range of stressor values over which the curved response occurs. Model averaging (Burnham and Anderson, 2002) is recommended for use with multiple regression when slight changes in the data lead to different final models.

- The Guidance provides a limited list of the statistical methods that could be explored to yield useful criteria. If a data set includes censored values, maximum likelihood estimation can provide an alternative to bivariate or multivariate linear regression that avoids the need to substitute values such as one-half the detection limit for nondetects. In addition, parametric multivariate methods including principal components analysis (PCA), discriminant function analysis, cluster analysis, and others may also provide a useful means of incorporating covariates in a stressor-response relationship. PCA may be used to describe a group of correlated variables through a single equation. A number of non-parametric linear regression approaches are also available, including the family of Kendall tests available from the U.S. Geological Survey (Helsel and Hirsch, 1992; Helsel et al., 2006)

- A key and an associated appendix of case studies should be included in the Guidance to explain the appropriate use of statistical methods and inherent assumptions and uncertainties. Since choice of method(s) will depend on the nature of the data being modeled and on the underlying assumptions, it would be useful to include in the Guidance some kind of key giving an explanation of "which method to use when," with the inherent required assumptions and uncertainties associated with each method. Better use of case studies (from lakes, streams, estuaries) in an appendix could help show "why one approach works in a particular situation and another does not." One case study should estimate the stressor-response relationship when the data form a "wedge-shaped" scatterplot, a pattern commonly observed in nutrient stressor-response relationships.

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- Statistical rigor is essential to the development of scientifically defensible criteria. Simplistic application of approaches in the Guidance can lead to stressor-response relationships with poor predictive power and result in inappropriate numeric nutrient criteria. Therefore, EPA will need to provide technical support and training to states for use of these statistical methods. As previously stated, the use of bivariate methods (including nCPA) must involve a careful examination of potentially confounding variables to develop support for a predictive relationship. In order to properly evaluate the predictive power of empirical stressor-response relationships, uncertainties associated with each method used must be identified and quantified. Simulated data sets designed to contain specific properties that may be encountered by users of the Guidance could help communicate how these statistical procedures behave over a variety of data set characteristics (e.g., a range of uncertainty in the regression slope).

- The need for statistical rigor applies to both the strength and the form of the relationship among variables (i.e., evaluating the presence of curvature in a stressor-response relationship). The Guidance should describe the goal of data analysis as one of characterizing not only the strength of relationship but also its form, and the evidence supporting conclusions about both. This is particularly relevant when deciding to use nCPA or discontinuous regression to characterize a relationship. A more complete approach should be presented to test the hypothesis that a true data threshold exists.

- EPA should provide guidance on how the degree of relationship (indicated by R^2, residuals analysis, and other evidence) relates to establishing predictive stressor-response relationships. At a minimum, EPA should describe how to address the important question of "when is the evidence insufficient to support using a empirical stressor-response approach?" One suggestion is to better incorporate the EPA data quality objectives process into the Guidance (see U.S. EPA, 2009c).

Findings on indirect pathways

- The Committee notes that, with respect to approaches used to address indirect pathways of adverse effects, the Guidance currently does not contain a clear definition of the term "indirect pathway." One definition follows in part from the caption of Figure 10 in the Guidance:

  > "Simplified diagram illustrating the causal pathway between nutrients and aquatic life use impacts. Nutrients enrich both plant/algal as well as microbial assemblages, which lead to changes in the physical/chemical habitat and food quality of streams. These effects directly impact the insect and fish assemblages. The effects of nutrients are influenced by a number of other confounding factors as well, such as light, flow, and temperature."

  This description appropriately indicates that nutrient concentrations directly impact plant/algal and microbial communities and indirectly impact insect and fish assemblages through impacts on plant/algal and microbial communities. As discussed previously, a challenge in using empirical approaches is establishing sufficient evidence to support

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conclusions of cause and effect so that relationships with adequate predictive power can be developed. The farther removed the response variables are from immediate responses of variations in nutrient concentrations, the more difficult it may be to demonstrate a useful degree of predictive power. Guidance on the acceptable degree of uncertainty, and/or the desired level of predictive power, may help users of the Guidance identify useful relationships whether or not pathways are direct or indirect. On the other hand, empirical methods alone are unlikely to effectively address indirect pathways of adverse effects. This requires appropriate conceptual and mechanistic models, adequate site-specific data, and experienced professional judgment.

Findings on confounding variables and uncertainty

- As previously discussed, exploratory data analysis that includes classification of data by similarities in confounding variables prior to the evaluation of stressor-response relationships may improve the predictive power of the relationships if sufficient data are available. Incorporation of confounding variables in a multiple regression is also appropriate. [See the responses to Charge Questions 1, 2, and 3 for additional discussion.]

- Because uncertainty in the appropriate criterion value cannot be eliminated, it is prudent to evaluate the potential consequences of varying degrees of uncertainty in a stressor-response relationship on the resulting criteria and management objectives. This may be accomplished in part through the use of the EPA data quality objectives (DQO) process or a similar approach. [See the responses to Charge Questions 1, 3, 6, and 7 for additional discussion of evaluating uncertainty in the stressor-response relationship.]

- References should be provided to direct the reader to more information on regression diagnostics including leverage statistics and information on influential points. This would assist the user in addressing uncertainties associated with these values. (One useful textbook is Kutner et al., 2004; there are many others.)

- The Guidance should emphasize the importance of careful pairing of potential stressor and response variables. Uncertainty in a stressor-response relationship may be increased if incompatible data types are paired. For example, combining a seasonal average chlorophyll a concentration calculated from multiple samples with a TP concentration obtained from a single grab sample could introduce considerably more uncertainty than if both variables represent seasonal averages. There are places in the Guidance where measured values are presented without a clear description of the spatial or temporal components that the value represents (on p. 22, for example, 15 ug/L chlorophyll a is presented as a threshold between mesotrophic and eutrophic conditions without indicating the applicable averaging period). The Guidance should consistently include such information in its descriptions of various components of the threshold identification and criteria-setting process.

Key recommendations concerning statistical methods in the Guidance

The Committee provides the following key recommendations to address the comments and findings presented above.

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1. In the Guidance, EPA must provide more information on the supporting analyses needed for each statistical method to correctly identify useful predictive relationships, and acknowledge that the use of these statistical methods alone cannot provide sufficient evidence of a cause-effect relationship.

2. The Guidance should indicate that response variables must in all cases have biological relevance and be associated with designated uses.

3. The Guidance should emphasize that use of the statistical methods requires careful consideration of confounding variables before the methods can be used as predictive tools. As discussed above, further information on how to address confounding variables should be included in the document.

4. The Guidance should contain additional discussion of the potential consequences of varying degrees of uncertainty in a stressor-response relationship on the resulting criteria and management objectives. This may be accomplished in part through the use of the EPA DQO process or a similar approach.

5. The Guidance should contain more information on approaches that address multiple factors, such as a stratified (or hierarchical) approach that considers other attributes known to be important such as canopy, habitat, multiple nutrients, etc.

6. EPA should consider replacing the examples in the Guidance that provide low explanatory power.

7. As discussed above, the Guidance should contain additional specific information (or guidance on where to find it) on:

    - The use of parametric (e.g., Pearson) and non-parametric (e.g., Spearman's rank, Kendall's tau) correlation analyses.
    - The importance of variable selection (including careful pairing of stressor and response variables) and data characteristics to ensure useful implementation of the statistical procedures.
    - Regression assumptions, limitations, and diagnostic procedures.
    - Interpretation of results from the listed regression procedures.
    - The role of, and options for, data transformations.
    - How and when the results of multiple statistical procedures may be integrated to support numeric criteria.
    - An appendix of case studies to explain the appropriate use of statistical methods and inherent assumptions and uncertainties.

8. The Committee recommends that EPA consider providing technical support and training to states and tribes to assist them in the use of the statistical methods in the Guidance.

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9. The Guidance should describe the goal of data analysis as one of characterizing not only the strength of relationship but also its form, and the evidence supporting conclusions about both.

10. The Committee emphasizes that EPA should provide guidance on how the degree of relationship (indicated by R^2, residuals analysis, and other evidence) relates to establishing predictive stressor-response relationships for numeric nutrient criteria development.

3.6. Charge Question 6. Evaluating the predictive accuracy of stressor-response relationships

Section 4 of the draft guidance document describes how to evaluate the predictive accuracy of estimated stressor-response relationships. Please comment on the appropriateness of approaches in Section 4 of the guidance document and factors to consider in evaluating and comparing different estimates of the stressor-response relationships and selecting those most appropriate for criteria derivation.

Overall, the Committee notes that Section 4 of the Guidance lacks the detail provided in other sections and, as discussed below, needs improvement. The Committee finds that this section is particularly important because it addresses the reliability or "validity" of the approaches considered. The Guidance should provide information to help managers decide which criteria derivation approach to use (e.g., analysis of best fit by regression or some other means). These are important decisions and additional guidance on how to select the best tools would be helpful. If the proposed methods yield inaccurate results, this could lead to inappropriate or ineffectual solutions to comply with Clean Water Act goals. The Committee provides the following findings and comments in response to Charge Question 6.

- <u>The Committee finds that a clear framework and criteria for statistical model selection is needed in the Guidance.</u> This framework should include a set of decision tools and criteria used not only to determine which model fits best, but also to decide whether the stressor-response approach to criteria development is appropriate. Model selection criteria should include:
  - Capability of model to consider cause-effect and direct-indirect relationships between stressor and response;
  - Biological relevance;
  - Relevance to known mechanisms and existing conditions; and
  - Capability of model to predict probability of meeting designated use categories.

Findings on model validation

- <u>More detail is needed in Subsection 4.1 of the Guidance to describe model validation techniques.</u> In the Guidance there is limited discussion of validation of empirically derived stressor-response relationships. This is a critical component. Validation can be defined as demonstrating the accuracy of the model for a specified use. Within this context, accuracy is the absence of systematic and random error - in ecology they are commonly known as

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trueness and precision respectively. All models are by their nature incomplete representations of the system they are intended to model but, in spite of this limitation, models can be useful. Many discussions of mathematical modeling discriminate between model confirmation (i.e., plausible, worthy of belief) and model verification (i.e., shown to be true). Given the nature of the environmental stressor and response data, such stressor-response models cannot be fully validated. EPA should provide much more detailed validation guidance including four components:

- *Conceptual validation* concerns the question of whether the model accurately represents the environmental system. This is largely qualitative and requires consideration of the strength of the cause-effect relationships. To consider whether the empirical model assumptions are credible, a conceptual model of factors affecting the stressor-response relationship should be developed. For each of the proposed methods, guidance should be provided with examples showing the mechanistic reasoning behind the cause-effect assumptions and the direct-indirect responses of the stressor and response variables. This should be supported by some experimental evidence relevant to the context in which it is used (e.g., data needs appropriate for lakes may be different than for streams). For each application of the empirical model, experimental or observational data in support of the principles and assumptions should be presented and discussed.
- *Algorithm validation* concerns the translation of model concepts into mathematical formulae. It addresses questions such as: "Do the equations represent the conceptual model?" "Under which conditions can simplifying assumptions be justified?" "Is there agreement among the results from use of different methods (e.g., different response variables) to solve the model?" For ecological stressor-response models, these questions relate to the adequacy of the empirical models themselves for describing the effects of nutrient enrichment on aquatic life.

- *Functional validation* concerns checking the model against independently obtained observations. For this type of validation the Guidance recommends using additional empirical observations (an alternative experimental data set). However, this requires more information than is usually available, and expected results may not be the same from one data set to another given the heterogeneity of environmental systems. Such data cannot truly validate the stressor-response model per se, but may produce valuable insights. Guidance is needed to answer questions such as: "what are the minimum data requirements for validation?" and "if one is working with a limited data set, how does one consider the tradeoffs between using more data in the original analysis and reserving data for validation?"

- *Software validation* concerns the implementation of mathematical formulae in various computer software. This validation takes into consideration the possible effects of software-specific factors on the model output (e.g., with regard to precision). For example, problems have been documented with regard to performing statistical analyses with some spreadsheet programs or open source codes.

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- The Committee finds that the concept of "validation" as presented in Subsection 4.1 of the Guidance is inconsistent with other EPA guidance (U.S. EPA, 2009a) on development, evaluation, and application of models. In EPA's other modeling guidance, model evaluation includes model corroboration, and sensitivity and uncertainty analyses. Model corroboration is defined as quantitative and qualitative methods for evaluating the degree to which a model corresponds to reality. In practical terms, this is the process of "confronting models with data." In some disciplines, this process has been referred to as validation. EPA prefers the term "corroboration" because it implies a claim of usefulness and not truth. The Committee finds that this is not just a semantic distinction and we recommend that Subsection 4.1 of the Guidance be revised so that it is consistent with other EPA guidance (U.S. EPA, 2009a).

- The use of data quality objectives (DQOs) should be discussed in Subsection 4.1 of the Guidance. The DQOs should be established at the beginning of the criteria development process (i.e., Guidance step one) but they can also be used to evaluate the potential stressor-response models (Guidance step four). The discussion of DQOs should address levels of uncertainty, Type I and Type II error rates, and the extent to which each model can predict the probability of meeting designated use categories. [See the response to Charge Question 1 for additional discussion of DQOs.]

- In Subsection 4.1, more detailed guidance should be provided on the use of randomly or non-randomly selected data sets to help address questions about how much data should be held out of the original analysis to adequately support the validation process. Subsection 4.1 is intended to describe how to validate "the predictive performance of different models." Recommended approaches include: a) collecting new samples; and b) holding out a subset of the original data from the analysis. Reserved samples may be selected randomly or non-randomly. Authors of the Guidance appropriately note that a potential problem with using random subsetting is that the covariance structure of the data is likely to be the same, so that this approach may not provide an independent test of the predictive power of a relationship. As stated in the Guidance, reserving a non-random subset may be a useful alternative. Some discussion of the relative size of calibration and validation data sets is warranted.

- The concept of "best fit" needs elaboration in the Guidance. Best fit is based on the assumptions made and the model developed and, as previously discussed, there may be considerable uncertainty even if a model is thoroughly and carefully developed. Assumptions that are incorrect or incomplete will lead to erroneous criteria. Authors of the Guidance understand this, and state that relationships can be confounded by unsampled or unmodeled factors. This statement is true and it should be more fully discussed, and perhaps given much greater weight in each section. EPA should consider whether each example in the Guidance should be accompanied by a discussion of possible confounding issues and what might be missing. The concept of uncertainty, its effect on model results, and ways to at least understand the level of uncertainty are not fully described in the Guidance.

- The Guidance should contain additional information to assess the closeness of root-mean-square predictive error (RMSPE). The RMSPE as presented on p. 42 of the Guidance is a well-recognized measure of how well a statistical model does in predicting response values from given stressor values. Figure 27 of the Guidance gives an example where the RMSPE

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for the calibration data set was 0.28, while the RMSPE for the held-out validation data (from a particular State) was 0.27. Many would agree that those two RMSPEs are "close." But it is necessary to answer the question, "how close is close?" No further statements appear in the Guidance about how to assess the closeness of two RMSPEs. Comparing 0.28 with 0.27 in a single example does not help users of the Guidance extend this example to their own data sets. It might be possible to take a bootstrap approach with regard to the calibration data set to derive an actual distribution of values for the calibration RMSPE against which the RMSPE of the validation data set could be compared. The Guidance does not address this. In addition, it is appropriate to characterize fit quality using other information such as R^2, residuals analysis, and regression results.

- With regard to validation, nutrient criteria should result from weight-of-evidence from the application of multiple empirical approaches considering multiple response variables and other approaches as appropriate. The nutrient criteria values determined after considering validation and uncertainty may vary significantly from technique to technique or from response variable to response variable. The Committee suggests that EPA consider the range of responses and concordance among analyses/models and, as stated previously, establish linkage between response variables and designated use categories. The Guidance should discuss model averaging and should recommend considering the range of responses as a measure of overall utility of the empirical approach. In addition, the Guidance should more strongly advocate decision making based on weight-of-evidence from multiple empirical and other approaches. [See the responses to Charge Questions 1, 3, 5, and 7 for additional discussion of weight-of-evidence.]

Findings on qualitative assessment of the uncertainty of the estimated stressor-response relationship

- The Committee finds that Guidance Subsection 4.2 (addressing uncertainty) is too brief. Given the importance of this cross-cutting issue, a section on uncertainty is needed for each of the steps outlined in the Guidance, and uncertainty should be summarized at the end of the document.

- Subsection 4.2 of the Guidance should address both qualitative and quantitative estimates of uncertainty. Given reasonable expectations for data availability and inevitable limits on the conceptual understanding of complex environmental systems, the Guidance should discuss both qualitative and quantitative estimates of uncertainties. The Committee notes that an explicit accounting of uncertainty is critical.

- Validity of the space-for-time substitution assumption can be supported by analysis of long-term stressor-response data for selected data-rich sites. Subsection 4.2 of the Guidance states that all stressor-response models estimated from cross-sectional or synoptic data must also invoke the assumption that spatial differences in sites can be substituted for temporal differences without a substantial degradation of model accuracy (i.e., the space-for-time substitution). As the Guidance states, a good way to provide support for the validity of this assumption is to analyze long-term stressor-response data for selected data-rich sites.

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- As previously discussed, the Guidance should contain additional information about the importance of considering "data bias" in interpreting the stressor-response results with regard to predictive performance and uncertainty, and also the importance of uncertainty imposed by model assumptions. Additional guidance is needed on to how to interpret data from a particular environment (e.g., a data set based on lake data) and its appropriateness (or lack thereof) for describing conditions more broadly. It would be helpful to include in the Guidance examples of databases that would be "ideal" or appropriate for each empirical model presented. For example, would the conceptual model for considering nutrient criteria be ideally approached using seasonal data, data from shaded versus unshaded tributaries, data from wadeable streams versus big rivers, and/or long versus short term averages of data describing the stressor or the response? [See the Responses to Charge Questions 1 and 2 for additional discussion.]

Findings on selection of the stressor-response model

- The Committee notes that Subsection 4.3 of the Guidance should discuss grounding models in reality through use of prior knowledge. A great deal is known about the effects of nutrients on aquatic systems, and the relationships between variables should reflect that knowledge. All models should be evaluated to determine whether they make sense biologically (e.g., is the range of data used appropriate? are the models mechanistically sound?). [See the response to Charge Question 5 for additional discussion.]

- Subsection 4.3 of the Guidance could be improved by providing a more detailed discussion of how to decide when to use each method to model stressor-response relationships, and the advantages/disadvantages associated with each method. Table 1 on page 44 of the Guidance is not sufficient for this purpose. It would be beneficial to provide a case study using a single data set to demonstrate the comparison of a range of model choices.

- The Committee notes that the stated objective of Subsection 4.3 in the Guidance, "demonstrating how to select a stressor-response model using the response variable that best represents the data," is not the same as the goal of Section 4, "evaluating the predictive accuracy of estimated stressor-response relationships." Confidence in predictive accuracy should be the primary consideration in model selection. Further, while it may ultimately be necessary to select a single model, one should also understand the significance to criteria derivation of selecting among reasonable alternative models or the effect of model averaging when a single most appropriate model cannot clearly be identified.

- In Subsection 4.3 of the Guidance, more detail should be provided in the discussion of conditions under which the last two methods, non-parametric changepoint analysis (nCPA) and discontinuous regression, should be applied (other than simply stating that they should be used when a direct designated use impairment threshold is unavailable). In addition, the Committee notes that a curved response: 1) may or may not be real; 2) may or may not signal an impaired designated use; and 3) may or may not be indicated at all by the data. Further, a curved response may be modeled by one of the linear methods after transformation. [See the response to Charge Question 5 for additional discussion.]

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- The Committee notes that linear stressor-response functions may not provide high levels of accuracy for nutrient criteria development. Six different methods are summarized in Table 1 of Subsection 4.3. The first four methods all assume that the stressor-response function can be modeled sufficiently as a linear model or a generalized linear model. It is unlikely that linear stressor-response functions can ever achieve high levels of accuracy across the many different confounding variables and the many different physical, chemical and biological characteristics of specific sites.

Key recommendations concerning evaluating the predictive accuracy of estimated stressor-response relationships

As a consequence of the findings presented above, the Committee provides the following key recommendations.

1. The Guidance should be revised to provide a clear framework for statistical model selection. This framework should include a set of decision tools and criteria used not only to determine which model fits best, but also whether the stressor-response approach to criteria development is appropriate.

2. The Guidance should be revised to provide much more detailed model validation guidance.

3. Subsection 4.1 of the Guidance (Model validation) should be revised to:

    - Make it consistent with other EPA guidance (U.S. EPA, 2009a) on development, evaluation, and application of models.

    - Provide more detailed information on the use of randomly or non-randomly selected data sets to help address questions about how much data should be held out of the original analysis to adequately support the validation process.

    - Elaborate upon assumptions and uncertainties in "best fit" determinations, and in particular provide additional information to assess the closeness of root-mean-square predictive error (RMSPE).

    - State that nutrient criteria should result from a weight-of-evidence approach based on the application of multiple empirical approaches considering multiple response variables as appropriate.

4. Subsection 4.2 of the Guidance should be revised to provide an expanded discussion of uncertainty. This section should address both qualitative and quantitative estimates of uncertainty as well as data bias.

5. Subsection 4.3 of the Guidance should be revised to:

    - Address grounding models in reality through use of prior knowledge.

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- Provide a more detailed discussion on how to decide when to use each method for modeling stressor-response relationships, and the advantages/disadvantages associated with each method.

- Provide more detail regarding the conditions under which the last two methods, non-parametric changepoint analysis (nCPA) and discontinuous regression, should be applied.

- Address inaccuracies associated with linear stressor-response functions.

3.7. Charge Question 7. Evaluating candidate stressor-response criteria

Section 5 of the draft guidance document describes how to evaluate the candidate stressor-response criteria. An approach is outlined for predicting conditions that might result after implementing different nutrient criteria. Please comment on uncertainties that would remain if water quality criteria for nutrients were based solely on estimated stressor-response relationships and in what ways other information/analysis would help address and possibly reduce this uncertainty.

Section 5 of the Guidance is an important part of the document because selection of criteria has environmental, social, and economic consequences. We provide the following comments and findings in response to Charge Question 7.

Findings on recognizing uncertainty

- <u>As previously discussed, the Guidance does not address or partition inherent critical uncertainties in the stressor-response approach.</u> The Guidance describes approaches that use a data-mining exercise to demonstrate a possible cause-effect relationship for the nutrient-ecosystem response. However, the document does not address or partition inherent critical uncertainties in the stressor-response approach which, as demonstrated in examples in the Guidance and in public presentations given to the Committee, can be extremely large (e.g., several orders of magnitude). Because of the demonstrated uncertainties, prediction from an empirical stressor-response model for a specific system of interest cannot always be interpreted as an accurate prediction of future conditions. [See the responses to Charge Questions 1 and 5 for additional discussion.]

- <u>Uncertainty also results from climatic or other environmental conditions under which studies were conducted.</u> In addition to uncertainties documented in the Guidance and in the public presentations to the Committee, uncertainty also results from the climatic or other environmental conditions under which empirical studies were conducted and response models developed. Studies conducted over relatively limited conditions (e.g., wet or dry years) or short-term periods (e.g., base flows, summer) are unlikely to provide the robust response relationships required for criteria development.

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Findings on reducing uncertainty

- A major uncertainty inherent in the Guidance is accounting for factors that influence biological responses to nutrient inputs. For criteria that meet EPA's stated goal of "protecting against environmental degradation by nutrients," the underlying causal models must be correct. Habitat condition is a crucial consideration in this regard (e.g., light [for example, canopy cover], hydrology, grazer abundance, velocity, sediment type) that is not adequately addressed in the Guidance. Thus, a major uncertainty inherent in the Guidance is accounting for factors that influence biological responses to nutrient inputs. Addressing this uncertainty requires adequately accounting for these factors in different types of waterbodies. [See the responses to Charge Questions 1, 2, 3, and 5 for additional discussion.]

- Uncertainty in the water quality criteria for nutrients could be reduced by obtaining data from well-designed site-specific monitoring programs. If "water quality criteria for nutrients were based solely on estimated stressor-response relationships," a critical overall uncertainty would be understanding where, within the range of probabilities, a single waterbody to which the criteria are applied will fall. This, in effect, is uncertainty in the space-for-time assumption discussed in the Guidance. That is, if the criterion nutrient concentration developed using an approach involving data from multiple locations is exceeded, will the predicted response and designated use impairment occur at a single location of interest? This type of uncertainty can be reduced by obtaining data from well-designed site-specific monitoring programs. Such monitoring would focus on obtaining specific information on the variability in stressor and response variables and important covariates with a goal of better defining the interactions of multiple variables and attributes affecting the designated uses of a waterbody. Measurement of actual biological responses would be appropriate, emphasizing variables that respond most directly to changes in nutrient concentrations. These are typically measures of primary productivity or primary producers, or water chemistry changes such as DO and pH. Where necessary, such data may be used to develop computer simulation models specific to the system of interest that can facilitate forecasting of stressors and associated responses.

- Numeric nutrient criteria developed and implemented without consideration of system specific conditions (e.g., from a classification based on site types) can lead to management actions that may have negative social and economic and unintended environmental consequences without additional environmental protection. The Committee emphasizes the importance of not only recognizing but also making allowance in the Guidance for conditions specific to the system of interest so that the resulting science allows the best management decisions to be made. In this regard, as previously discussed, we recommend use of a tiered weight-of-evidence approach to criteria development. Weight-of-evidence is typically used to determine the tier at which uncertainty has been reduced sufficiently for informed management decision making. [See the responses to Charge Questions 1, 2, 3, and 5 for additional discussion.]

- The Guidance can be used to develop numeric nutrient criteria in a tiered, weight-of-evidence assessment using appropriately modified EPA approved procedures together with other approaches that address causation. Large uncertainties in the stressor-response relationship

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and the fact that causation is neither directly addressed nor documented indicate that the stressor-response approach using empirical data cannot be used in isolation to develop technically defensible water quality criteria that will "protect against environmental degradation by nutrients." The Guidance can, however, be used in a tiered, weight-of-evidence assessment (using appropriately modified U.S. EPA-approved procedures, e.g., EPA's Causal Analysis/Diagnosis Decision Information System [CADDIS]), (U.S. EPA, 2009b). [See the responses to Charge Questions 1, 3, 5, and 6 for additional discussion.]

- EPA should consider addressing the use of probabilistic modeling (using the distribution of data in the model and re-sampling or simulating a new distribution) to better determine significant stressor-response relationships. For instance, a statistically significant stressor-response relationship can be derived that may represent only a small portion of the variability in the data. Relying solely on this relationship would result in a tremendous amount of uncertainty in the final criterion developed. A good example of this is Figure 14 (p. 25) of the Guidance, which shows a statistically significant model that explains only 5% of the variation in the data - meaning that 95% of the variation is not explained by the model. Guidance on model selection is critical to reducing uncertainty. The selection of target numeric criteria as outlined in the Guidance is enhanced by the attempt to predict post-implementation conditions. However, the example used in Figures 29 and 30 of the Guidance is confusing as it appears that the values are re-projected using one criterion value (log TP=2) and the prediction analysis is made (i.e., that all 8 of the sites would still exceed the criterion) using a different value (log TP=1.6).

Findings on criteria application and monitoring for assessment

- The approach presented in Section 5 of the Guidance should be revisited and possibly replaced. It appears to be highly sensitive to the way that individual data points located above a response threshold are distributed around the regression line. For example, in Figures 30 and 31 of the Guidance, near the intersection of TP and chlorophyll a targets and candidate criteria, more than half of the data points fall above the regression line which reflects the best fit to all the data. Projecting back to lower TP concentrations for each of these individual data points would force a lower TP criterion than would be the case if the data were actually normally distributed around the regression line. In other cases, there may be a "cluster" of data points below the regression line, and the back-projected TP criterion would be higher than if all data points were distributed randomly about the regression line.

- The Guidance does not adequately address the important issue of continued monitoring and assessment for adaptive management. With regard to application of numeric nutrient criteria, Section 5 of the Guidance discusses comparison of predicted and observed data to evaluate response(s), along the lines of adaptive targets. This intrinsically implies that continued monitoring and assessment of concentration versus biological response is taking place. While this is a good idea in principle, it is not clear from the Guidance that this is to be done, how it is to be done, or at what scale it should be done. This is important because it relates to the issue of measuring changes in indicators of biological response as nutrient inputs are reduced to waterbodies. It is unclear how hereditary or legacy losses or inputs of N and P to waterbodies will be considered and accounted for in such an empirical approach. This begs

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the next set of questions facing water resource managers who establish targets for nutrient loss reduction: "if no water quality improvement or indicator biological response is seen, are the targets/criteria too high or are legacy nutrient inputs increasingly significant contributors?" and "how long does it take dynamic ecosystems and watersheds to respond to changing nutrient inputs?"

- The Guidance should address a number of questions to clarify how the evaluation of candidate stressor-response criteria will occur, presumably through monitoring. These questions include the following:
  - While a sound monitoring program will be essential, what form will this take?
  - At what level in time and space will monitoring be established to evaluate criteria?
  - Where, when, and how will samples be collected to establish a long-term monitoring program to clearly define and measure candidate response(s) to any changes in management and stressor inputs, as predicted by nutrient criteria?
  - How will monitoring be conducted to give a whole watershed assessment, considering all nutrient sources and stressors that are contributing spatially and temporally?
  - How will continued legacy stressor inputs (N and P) be distinguished from management change-related decreases? Internal recycling of nutrients can mask water quality improvements brought about by nutrient loss reductions resulting from land management changes.

- The direct and indirect effects of best management practices should be captured in setting numeric nutrient targets and evaluating responses to target reductions. Implementation of practices to decrease nutrient losses or inputs to surface waters (i.e., best or beneficial management practices [BMPs]) can influence other factors that will affect biological response to nutrient loadings. For instance, riparian buffers are effective at removing sediment and sediment-bound nutrients (particularly P), as well as removing N by uptake and denitrification. However, they also provide shade and will influence stream water temperature and thereby the stressor-response relationship. Such interactions should be addressed in nutrient criteria development. In addition, the use of buffers, for example, will influence the size of particulates or sediment in a stream or river that may affect the benthic population dynamics or species diversity. These direct and indirect effects and complexities should be captured in target setting and the evaluation of response to achieving target reductions.

Key Recommendations in response to Charge Question 7

The Committee provides the following key recommendations to address the comments and findings above.

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Key Recommendations with regard to recognizing uncertainty

1. The Guidance needs to clearly indicate that the empirical stressor-response approach does not result in cause-effect relationships; it only indicates correlations that need to be explored further. For example, the words "cause-effect" should be removed from the title of Step two.

2. The Guidance should address partitioning the uncertainty among the various factors that are involved in the stressor-response relationship for the specific region/system of interest. Some variables may be irrelevant to the hypothesized model for that system.

3. The Guidance should better document the physical, chemical and biological variables comprising the relationships (e.g., habitat, spatial, and temporal) that define the aquatic system, and which may be important in modifying the relationship between nutrient concentrations and observed endpoints. These factors need to be well documented so that the uncertainty in the relationship between nutrient concentrations and measured endpoints can be reduced.

Key recommendations with regard to conceptual models and uncertainty description/analysis

4. The Guidance should caution users about potential problems associated with using the overall regression to predict conditions that might result after implementing different nutrient criteria.

5. EPA should consider addressing the use of probabilistic modeling to better determine significant stressor-response relationships.

6. The Guidance should address uncertainty resulting from climatic or other environmental conditions under which studies were conducted.

7. EPA should discourage use of "biased" databases (i.e., that do not contain the range of data necessary to fully characterize a system of interest) to develop stressor-response relationships.

8. When cross-sectional data are used to develop empirical models, the ranges of values for stressors and responses in the cross-sectional data should fully encompass not only the current conditions in systems of interest, but also the predicted values for the stressors and responses corresponding to removal of the designated use impairment.

9. The Committee recommends predicting conditions that might result after implementing different nutrient criteria and testing these conditions on specific data-rich systems of interest.

10. The Committee recommends that EPA frame uncertainty according to the following key issues:

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- What are the goals of the decision makers (e.g., what are the designated uses and when are they impaired?), and what amount of certainty is required to make that decision?

- Are the mechanisms of the cause-effect relationship understood and are they reflected in the types of measurements recommended?

- Do the variables measured reflect the goals of the Clean Water Act? In the examples presented in Section 5 of the Guidance species richness or chlorophyll a are not clearly linked to the stated goals (fishable, swimmable waters, etc).

- Does the analysis tool reflect a known cause-effect relationship and does it allow an understanding of the process?

- What are the *a priori* criteria to be met by the data? This must be established to make it possible to tell when the data cannot support the decision making process.

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ED_001523_00003567-00067

Commonwealth of Pennsylvania
Department of Environmental Protection
February 19, 2002

Subject: Periphyton Standing Crop and Diatom Assemblages in the Wissahickon Watershed
Wissahickon Watershed
Montgomery and Philadelphia Counties
Stream Code: Wissahickon Creek (00844)
Sandy Run (00859)
Prophecy Creek (00875)
Trewellyn Creek (00886)

To: Stream File

From: Alan C. Everett
Water Pollution Biologist II
Water Management

Through: Michael Boyer
Biologist Supervisor
Water Management

Steve O'Neil
Operations Chief
Water Management

ED_001523_00003568-00001

Abstract

RELATIONSHIP BETWEEN PHYSICOCHEMICAL CONDITIONS AND PERIPHYTON (STANDING CROP AND DIATOM ASSEMBLAGES) IN A NORTHERN PIEDMONT CREEK IMPACTED BY MUNICIPAL SEWAGE TREATMENT PLANT DISCHARGES AND STORM WATER. A.C. EVERETT1 AND N. WEST2. 1Pennsylvania Department of Environmental Protection, Southeast Regional Office, Lee Park, Suite 6010, 555 North Lane, Conshohocken, PA 19428, 2Patrick Center for Environmental Research, Academy of Natural Sciences, Philadelphia, PA 19103

Periphyton standing crop and diatom assemblages were used to assess the effect of nutrients from municipal discharges and storm water on Wissahickon Creek. Wissahickon Creek is tributary to the Schuylkill River and drains 167 km2 of Montgomery and Philadelphia Counties in Southeastern Pennsylvania. Physicochemical and benthic algal sampling was performed at 7 main stem stations and 3 tributary stations during base flow conditions in August and September 1998. Total reactive phosphorus and inorganic nitrogen concentrations at stations influenced by municipal dischargers were respectively 13 to 51 times and 3 to 12 times greater than suggested mesotrophic-eutrophic boundary concentrations. Large diel dissolved oxygen swings and low minimum DO concentrations associated with excessive algal growth were documented at two stations. Periphyton chlorophyll-a concentrations ranged from 48 mg/m2 to 276 mg/m2 and were negatively related to percent canopy cover. Standing crop at open canopy stations was higher than at closed canopy stations and positively related to inorganic N concentration. Diatom assemblages were indicative of eutrophic conditions, with Kelly's Trophic Diatom Index ranging from 76% to 92%. Our study demonstrates the importance of riparian vegetation in limiting algal biomass in nutrient enriched streams and documents the need for nutrient reductions in the Wissahickon Watershed.

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Introduction

Benthic algal communities are significant primary producers in wadable streams and can be utilized as indicators of environmental conditions (Barbour et al. 1999). Periphyton standing crop and community composition are influenced by nutrient levels, light, hydrologic condition, temperature, substrate type and herbivore grazing (Stevenson 1996). Accrual of benthic algal standing crop depends primarily on the level of two resources: nutrients and light (Biggs, 1996). Eutrophication may cause different algal taxa to become more competitive and taxa composition can shift (Dodds and Welch 2000). Generally, filamentous chlorophytes become abundant, sometimes creating nuisance conditions, when high nitrogen and phosphorous levels and adequate sunlight are provided. Studies have shown that phosphorus concentrations of only 25 to 50 ug/l orthophosphate are needed to maintain maximum benthic algal biomass in streams (Borchardt 1996). In small streams, riparian leaf canopies can intercept 95% of incident solar radiation. Benthic algal standing crops, as chlorophyll-a, can be 4 to 5 times higher at open canopy sites than at closed canopy sites (Hill 1996). Nuisance levels of algae and periphyton community shifts associated with high nutrients may cause water quality impairment (e.g. low dissolved oxygen), negative impacts to macroinvertebrates and fish, or aesthetic impairments for water users (Dodds and Welch 2000). Pennsylvania does not have nutrient or biological response (e.g. algal biomass) criteria incorporated into water quality standards (Chapter 93). Large diel variation and associated low dissolved oxygen concentrations are currently used as indicators of nuisance algae conditions. Recent research, examining nutrient levels and biological responses, could provide the basis for future criteria.

Dodds (1998) examined a worldwide temperate stream database and developed a suggested classification of stream trophic state based upon frequency distributions of total nitrogen (TN), total phosphorus (TP) and Chlorophyll a. The oligotrophic-mesotrophic boundary was 700 ug/l for TN, 25 ug/l for TP, 20 mg/m^2 for benthic Chl-a, and 60 mg/m^2 for maximum benthic Chl-a. The mesotrophic-eutrophic boundary was suggested to be 1500 ug/l for TN, 75 ug/l for TP, 70 mg/m^2 for mean benthic Chl-a, and 200 mg/m^2 for maximum benthic Chl-a. EPA's (2000) nutrient guidance criteria for Nutrient Ecoregion IX, which includes Wissahickon Creek, is similar to Dodds' oligotrophic-mesotrophic boundary: TN = 692 ug/l, TP = 37 ug/l, and Chl-a = 20mg/m^2. Other work has estimated that levels of nuisance algae are reached when Chl-a concentrations reach a threshold of 100 to 150 mg/m^2 (Welch et al. 1989) or macroalgae coverage exceeds 40 % (Biggs, 1996). Diatom assemblages have also been used to determine the trophic status of streams (Kelly 1996). These studies lack a region-specific perspective, but provide suitable references for comparison with nutrients and biological responses in the Wissahickon Watershed.

The purpose of this survey was to examine algal standing crop and community composition within the Wissahickon Watershed, determine relationships between physicochemical conditions and benthic algae, and compare results with literature reported chemical and biological values that indicate eutrophication. Semi-quantitative rapid periphyton (macroalgae) survey methods were compared with quantitative standing crop measurements as part of the survey.

The Wissahickon Creek is tributary to the Schuylkill River and drains 64 square miles of Montgomery and Philadelphia Counties in Southeastern Pennsylvania. Residential and commercial/industrial land uses dominate the watershed. Boyer (1997) provides a good geologic description of the basin. The Wissahickon Creek Basin is located in the Northern Piedmont Ecoregion (64). Three subecoregions are represented in the watershed: Triassic Lowlands (64a), Piedmont Lowlands (64d), and Piedmont Uplands (64c). The upper watershed from the headwaters to Fort Washington State Park is contained in the Triassic Lowlands Subecoregion

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and has shale, siltstone and sandstone parent materials. A two mile wide valley (Chester Valley) running southwest to northeast encompasses part of the Wissahickon Creek near Fort Washington State Park, most of the Sandy Run Basin, and some small UNTs to Wissahickon Creek. Chester Valley is located in the Piedmont Lowlands and has limestone parent materials. The lower Wissahickon Basin is located in the Piedmont Uplands Subecoregion and contains gneiss and schist parent material.

Summaries of the Department's Wissahickon Creek surveys prior to 1996 have been provided elsewhere and will not be reviewed here (Boyer 1997). Schubert (1996) investigated the nutrient status of Wissahickon Creek utilizing chemical sampling and the *Selenastrum capricornutum* Printz Algal Assay Bottle Test. Schubert concluded the following: 1) the Wissahickon Watershed was nutrient enriched, 2) water collected at all stations (4 main stem) exhibited high algal growth potentials, and 3) *Selenastrum capricornutum* biomass increased with increasing trace element concentrations but did not increase with increasing nitrogen and phosphorus concentrations, indicating trace element limitation and nonlimiting concentrations of nitrogen and phosphorus in the Wissahickon Creek water samples.

Boyer (1997) listed 26 NPDES permitted facilities which discharge treated effluent into the Wissahickon Creek Basin. Treated effluent represented 33.7% of average stream flow and 249% of the 7 day average low flow which occurs every 10 years (Q7,10) of the Wissahickon Creek at Bells Mill Road Bridge (Boyer 1997). Boyer's (1997) 13 station survey of the watershed examined base flow water chemistry, habitat, macroinvertebrates, and fish and concluded that the Wissahickon Creek is nutrient enriched and all stations were biologically impaired based upon EPA's Rapid Bioassessment Protocol for macroinvertebrates.

Everett (internal DEP data, UW Program) conducted a survey in 1997 examining macroinvertebrates and habitat utilizing Pa. DEP's Unassessed Waters Screening Protocol. Twelve tributary stations and 6 main stem stations were included in the survey. All stations except the Prophecy Creek station were biologically impaired. Benthic macroinvertebrate communities at impaired stations had low numbers of taxa, low numbers of pollution sensitive EPT taxa, and were dominated by the caddis fly family Hydropsychidae. Prophecy Creek's macroinvertebrate community was found to be unimpaired, having 16 total families, 4 pollution sensitive EPT families, and Philopotamidae as the dominant family. Everett (internal DEP data, UW Program) conducted a point source follow-up survey in 1998 which examined water chemistry and macroinvertebrate communities upstream and downstream from five municipal sewage treatment plants (Upper Gwynedd STP, North Wales STP, Ambler STP, Abington STP and Upper Dublin STP) and at the mouth of Wissahickon Creek. These five municipal dischargers account for approximately 92% of treated effluent discharging to the basin (Boyer 1997) All stations had impaired macroinvertebrate communities relative to the Muddy Creek ambient reference station. Base flow nutrient concentrations downstream from point sources indicated enriched conditions with the five municipal dischargers accounting for a majority of phosphorous and nitrogen loadings. The five municipal STPs accounted for 34% of the total flow at the mouth on July 7, 1998. Conclusions of the Unassessed Waters Screening and Point Source Survey were that storm water (flow variability, in stream sediment, nutrients) and municipal point sources (nutrients) were the primary sources of impairment in the basin. The Wissahickon Basin was placed on Pennsylvania's 303d list in 1998.

Wissahickon Creek and its tributaries are classified Trout Stocked Fishery (TSF) under the Department's Chapter 93 Water Quality Standards. TSF designation provides for the maintenance of stocked trout from February 15th to July 31st, and the maintenance and propagation of fish species and additional flora and fauna that are indigenous to a warm water habitat.

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Wissahickon Creek periphyton was surveyed by Water Pollution Biologists Mike Boyer, Steve Schubert and Allen Whitehead, Watershed Coordinator Nancy Crickman, and the writer on September 10,11,14, and 15 1998. Gary Jones, section leader for DEP laboratory biological services, and staff performed analyses for Chl-a, phaeophytin, and AFDM. Natalie West, a NSF REU student intern in Dr. Don Charles' Phycology Lab at the Academy of Natural Sciences of Philadelphia (ANSP), performed diatom identification and enumeration on qualitative rock samples.

The National Institute for Environmental Renewal (NIER) requested that Pa DEP conduct the survey in conjunction with NIER's base flow water quality sampling within the watershed (NIER, 1999). NIER had funding to develop an action plan for the basin, model pollutant loads, and organize the Wissahickon Partnership, a consortium of private and public stakeholders in the watershed.

Methods

Periphyton measurements were made at 7 stations on Wissahickon Creek, and one station on each of three tributary streams: Prophecy Creek, Trewellyn Creek, and Sandy Run (Fig. 1). Conditions within the watershed were well represented and included main stem stations and a Sandy Run station influenced by storm water and municipal point sources, a station influenced by storm water (Trewellyn Creek) and a station representing the best biological condition in the watershed (Prophecy Creek) based upon the Unassessed Waters Screening. Stations were not located upstream of point sources on the Wissahickon and Sandy Run because lack of base flow precluded sampling in riffle areas. All stations corresponded to NIER water quality stations allowing for comparison of chemical and biological data at each station (Table 1). NIER water quality sampling was conducted within a 3-week time interval prior to the mid September periphyton sampling. Results of NIER's water quality sampling are given in Appendix 1. Total phosphorus results were not included in the data set because of suspected contamination. All periphyton stations except P-MR (Prophecy Creek) and T-GH (Trewellyn Creek) had corresponding dissolved oxygen diel surveys that were conducted by NIER between 7/30/98 and 9/29/98. Diel dissolved oxygen data was collected at 15 minute intervals using YSI multiparamater data sondes which also recorded temperature, specific conductance, pH and turbidity. For the purposes of this report, data immediately following the 8/17/98 storm event were excluded because of the potential effect of scour on benthic algae standing crop.

Methods described below are modifications of those described in Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers (Barbour 1999). Riffle areas in close proximity to NIER water quality sampling stations were chosen for physical and biological sampling.

Physical Sampling

Length of riffle reach and percent substrate type were estimated visually. One transect, perpendicular to the stream, was randomly selected in the upper, middle, and lower 1/3 of the reach for a total of three transects. Wetted stream width at base flow was measured for each transect and averaged for a station stream width. Water depth ranges were estimated for the riffles. Canopy coverage was measured at mid-channel / mid-reach using a Model C Spherical Densiometer. Presence of tree or shrub canopy was calculated for 96 equi-spaced dots on the gridded concave mirror. Readings taken for North, East, South, and West were averaged and a percent cover was calculated for the station.

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Biological Sampling

Periphyton Standing Crop

Periphyton sampling was performed over a six-day period (9/10 to 9/16/98) under stable base flow conditions. Boulder, cobble, or large gravel substrates were randomly sampled from the left, center, and right 1/3 of the channel along each transect and composited prior to analysis. Periphyton was collected by pressing a 2-inch diameter (20.3 cm^2) PVC pipe section, fitted with a foam gasket (collar), against the substrate. With the PVC pipe section firmly pressed against the rock's surface, the rock was removed from the stream and attached algae was removed with a modified hard bristle toothbrush. The algal slurry was transferred to a plastic container with a cooking baster or wide-bore pipette. Samples were sieved (800um X 900 um mesh) to remove moss from the sample. Moss was gently brushed and shaken to remove entangled or epiphytic algae. Filamentous algae collected on the sieve was segmented with a razor blade on a glazed tile and rinsed back into the sample. A total sample volume was recorded for each transect.

Well-mixed subsamples were taken for Chlorophyll-a and Phaeophytin-a analysis, Ash Free Dry Mass (AFDM) analysis and algal identification and enumeration. Chl-a and AFDM samples were field filtered onto glass fiber filters (Gelman A/E, 1um). Filter volumes ranged from 20 to 50 mls depending on concentration of algal material. $MgCO_3$ slurry (1gm/100ml) was added to the filtered Chl-a sample for buffering and stabilization. Samples were stored on dry ice in the field (-20°C), in a conventional freezer at the DEP field office, shipped to Harrisburg (DEP Laboratory) on dry ice and stored in deep freeze (-30°C) prior to analysis. Samples were analyzed on 11/17, 11/23, 12/1 and 12/2/98.

Analysis and calculation of Chl-a (mg/l) and phaeophytin (mg/l) at DEP's Bureau of Laboratories followed spectrophotometric methods (Method 10200) described in Standard Methods for the Examination of Water and Wastewater (19th edition, 1995). Chl-a and phaeophytin concentrations per unit substrate surface area (mg/m^2) were calculated by multiplying the laboratory determined concentration (mg/l) by the total sample volume (l) and dividing by the total surface area (0.00608 m^2).

AFDM filters were analyzed gravimetrically by drying to a constant weight at 105 °C and igniting for one hour at 500 °C. This method is a modification of Method 10300c in Standard Methods for the Examination of Water and Wastewater (1995). Five filter blanks were analyzed and the average AFDM associated with filters blanks were subtracted from the AFDM samples. AFDM per unit substrate area (mg/cm^2) was calculated by multiplying AFDM sub sample concentration (mg/l) by total sample volume (l) and dividing by surface area (cm^2). Duplicate analyses for Chl-a, phaeophytin and AFDM were collected for two stations. The autotrophic index was calculated for each station as AFDM (mg/m^2) per Chlorophyll a (mg/m^2).

A 15 to 20 ml subsample was transferred to a scintillation vial and preserved with glutaraldehyde (2% diluted concentration) for algal identification and enumeration. These samples remain archived at DEP's Southeast Regional Office.

Diatom Flora

Rock, gravel, woody debris and sand/silt microhabitats were sampled separately at three random locations within the riffle at each station. Collections for each microhabitat were composited and a well-mixed 15ml sub sample was transferred to a 20 ml scintillation vial and preserved with glutaraldehyde. Sampling was conducted with a modified hard bristle toothbrush and a wide-bore pipette.

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Rock samples were identified to species and enumerated at ANSP (West 2000). Gravel, woody debris and sand/silt microhabitat samples were not examined because of resource constraints and remain at ANSP.

The diatom assemblage was described using five metrics: number of taxa, Trophic Diatom Index (TDI)(Kelly 1996), Shannon-Wiener Diversity Index, % Dominants and Siltation Index. The TDI is based upon species or genera specific pollution (nutrient) sensitivity ratings. Taxa are rated from 1, indicating taxa favored by very low nutrient concentrations, to 5, indicating taxa favored by very high nutrient concentrations. Taxa are also weighted from 0 to 3 according to their value as indicators. For example, predominately planktonic diatoms, which have settled in the benthos, would be given a value of 0. A weighted mean sensitivity of taxa present at a station is calculated and expressed as a percentage on a scale from 0 to 100. A eutrophic-mesotrophic boundary TDI of 67% was assigned by the writer based upon Kelly's sensitivity scale of 1 to 5. Percent dominants is the percentage of total diatom valves that accounted for greater than 10% of overall abundance in the sample and is a measure of community evenness. Siltation index represents the percentage of motile taxa. Motile taxa are better able to maintain substrate surface position in high siltation environments than nonmotile taxa.

Rapid Periphyton Survey

Semi-quantitative visual assessments were performed which estimated the maximum length (mm) and percent coverage of macroalgae (typically filamentous green algae). Three random locations along each transect, in the left, center, and right 1/3 of the channel, were examined using a viewing bucket with 49 equi-spaced dots organized in a 7" X 7" grid. Percent macroalgae coverage was estimated for each location by counting the dots where macroalgae was present. Maximum macroalgae length found within the grid was measured and recorded. Average percent coverage and average maximum length for each transect was considered one sample. Transect results for each station were then averaged for the mean station score. These quick objective visual methods were performed to see if they were correlated to standing crop and if they had potential as a screening protocol for other Department work. The rapid periphyton survey described in EPA's RBP Manual also discusses characterization of the microalgae. Microalgae assessments were not included in this survey because of difficulty in characterizing community type and thickness.

Aquatic Macrophyte Survey

The riffle reach and abutting upstream and downstream pools were surveyed for aquatic macrophytes. If present the relative abundance of the macrophyte was recorded based on a scale of one (rare) to 4 (abundant). Moss was found to be a significant component of biomass at some sites and samples collected in the standing crop transect sampling were collected in foil pouches and analyzed for AFDM according to methods described above for algal samples.

Statistical Analysis

All statistical analyses were performed using Microsoft Excel (Microsoft Office 2000) data analysis tools, except Principal Component Analysis (PCA). Descriptive statistics (mean, standard deviation, coefficient of variation, and variance) were calculated for Chl-a, phaeophytin, AFDM, % macroalgae coverage and maximum algae length. One way analysis of variance, with significance set at $p < 0.05$, was calculated for all biological variables at all stations except % macroalgae coverage at S-TR. Macroalgae coverage at S-TR included moss and therefore was not included in the ANOVA matrix. All data met the assumption of homogeneity of variance using the Fmax-test except AFDM and the autotrophic index. AFDM

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and autotrophic index data were log(base10) transformed to meet the assumptions of ANOVA. Pearson Product Moment Correlation analyses were performed on selected biological, chemical and physical variables for all stations. Correlation analyses were also used to examine interdependence of standing crop and field macroalgae results. PCA was used to graphically show physicochemical and biological relationships between stations. PCA analysis was performed using Statistica at the Philadelphia Water Department.

Results

Physical Assessment

Stream width ranged from 2.5 meters for Prophecy Creek station P-MR to a maximum width of 16.8 meters for Wissahickon Creek station W-RA (Appendix 1). Four 2nd order, three 3rd order, and three 4th order reaches were included in the survey. Percentage of boulder/cobble substrate in the sampled riffles ranged from 35% to 80% and provided adequate benthic algae sampling substrate. Percent canopy coverage ranged from a low of 1% (S-TR) at the Lu Lu Country Club along Sandy Run to a high of 58% (P-MR) on a forested reach of Prophecy Creek downstream from Morris Road.

Nutrients

Nutrient concentrations indicate enriched conditions at all Wissahickon Creek stations and at the Sandy Run station (S-TR). Total reactive phosphorus (TRP) ranged from 50 ug/l at T-GH to 3,800 ug/l at station S-TR (Fig.2). TRP concentrations at Wissahickon Creek stations and Sandy Run station S-TR were 13 to 51 times greater than Dodd's suggested mesotrophic-eutrophic boundary concentration for total phosphorous (TP = 75 ug/l). TRP does not include condensed phosphates and organically based phosphates that are included in TP analysis. Therefore, TP concentrations could be expected to be somewhat higher depending on concentrations of water column solids. The highest concentrations were found at stations located directly below municipal sewage treatment plants (S-TR, W-NW, W-PR, and W-GA). Phosphorus uptake, increased flow from tributary streams having lower P concentrations (e.g. Lorraine Run quarry, discharge), and adsorption/sedimentation are probably responsible for lower levels found in Fairmount Park (W-BM, W-RA).

TRP concentrations in Prophecy Creek (P-MR) and Trewellyn Creek (T-GH), the only stations without point source contributions, were below Dodd's suggested mesotrophic-eutrophic TP boundary concentration, but above EPA suggested nutrient criteria for Nutrient Ecoregion IX (TP = 37 ug/l) (EPA 822-B-00-019). Tinicum Creek, an ambient reference stream located in the Triassic Lowlands Subecoregion, and Cooks Creek, an ambient reference stream located in the Piedmont Lowlands Ecoregion, were sampled as part of Pa DEP's Water Quality Network (WQN) within the same 3 week period as NIER's water quality sampling (8/31/98). TP concentrations for Tinicum Creek and Cooks Creek were 10ug/l and 15 ug/l respectively, indicating that phosphorus is naturally low in streams having similar geology to the Upper Wissahickon and Sandy Run basins.

Inorganic nitrogen ranged from 222 ug/l (T-GH) to 17,478 ug/l (S-TR) (Fig.3). Wissahickon Creek and Sandy Run stations had inorganic nitrogen concentrations 2.6 to 11.7 times greater than Dodd's suggested mesotrophic-eutrophic boundary concentrations for Total Nitrogen (TN) (1500ug/l). Inorganic nitrogen values in the present study underestimate TN because organic nitrogen was not analyzed. Nitrate accounted for ≥ 97% of inorganic nitrogen except for stations P-MR (94%) and T-GH (71%). Nitrate concentrations exceeded Chapter 93 Water Quality Standards for public water supply at stations S-TR, W-PR, W-GA, and W-73.

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Similarly to phosphorus, the highest nitrogen concentrations were found at stations located below municipal sewage treatment plants (S-TR, W-PR, W-GA). Nitrogen uptake, denitrification and tributary dilution flows probably account for lower concentrations found in Fairmount Park (W-BM, W-RA). Inorganic nitrogen concentrations in Prophecy Creek (P-MR) and Trewellyn Creek (T-GH) were below Dodd's suggested mesotrophic-eutrophic boundary (1500 ug/l) and below EPA developed nutrient criteria guidelines for Nutrient Ecoregion IX (692 ug/l). Total nitrogen concentrations in Tinicum Creek and Cooks Creek were 230 ug/l and 1,720 ug/l respectively, suggesting naturally low nitrogen in the Triassic Lowland Ecoregion, but higher nitrogen in the Piedmont Lowlands (limestone geology).

Diel Dissolved Oxygen Sampling

NIER's diel dissolved oxygen (DO) data is summarized in Table 2. Average DO concentrations ranged from 4.16 mg/l at station W-NW to 8.78 mg/l at station W-RA. Minimum DO concentrations ranged from 1.34 mg/l (W-NW) to 7.11(W-RA). Wissahickon Creek at North Wales Rd. Bridge had average DO and minimum DO violations of Chapter 93 Water Quality Standards (Avg. = 5.0mg/l, Min. = 4.0 mg/l). Sandy Run at Twining Rd Bridge had minimum DO violations. Average diel swings were calculated by subtracting daily minimum DO from daily maximum DO and averaging diel swings for all days included in the sample. Physical parameters such as bed slope, flow, and temperature, or chemical parameters (BOD) can all influence dissolved oxygen in streams but diel productivity/respiration cycles associated with algal biomass are primarily responsible for dissolved oxygen swings. Diel DO swings were extremely high at stations S-TR (5.6 mg/l) and W-NW (5.9 mg/l), indicating that DO violations are the result of high algal biomass. Diel swings also appear high at stations W-PR and W-WA but water quality criteria violations were not found. Percent DO saturation ranged from 49% at station W-NW to 97% at station W-RA.

Other Chemical Parameters

Biological Oxygen Demand (BOD_5) was elevated at stations W-NW, W-PR, W-GA and W-73, indicating organic pollution associated with municipal sewage treatment plants. Fecal coliform concentrations were elevated above Chapter 93 Water Quality Standards at all stations except W-RA. Copper concentrations at stations W-NW, W-PR, and W-GA were elevated above Chapter 16 Toxics Criteria (estimate for total metals). However, a Water Effects Ratio (WER) was approved for Upper Gwynedd Twp. STP and Ambler STP resulting in site-specific criteria that are higher than concentrations found at corresponding downstream stations (W-PR, W-GA).

Periphyton Standing Crop

Periphyton standing crop as chlorophyll-a (Chl-a) ranged from a low of 48 mg/m^2 at station W-GA to 276 mg/m^2 at station W-PR (Fig. 4). Prophecy Creek (P-MR), which exhibited the best macroinvertebrate community in the watershed (1997 Unassessed Waters Survey), had Chl-a concentrations (73 mg/m^2) which were significantly lower ($P<0.05$) than six of the stations with the highest concentrations (Appendix 2). Chl-a concentrations at station W-NW was slightly underestimated because some filamentous algal strands were not disentangled from moss. Nine stations had Chl-a concentrations that exceeded the mesotrophic-eutrophic boundary for mean Chl-a (70 mg/m^2) and five stations exceeded the mesotrophic-eutrophic boundary for maximum Chl-a (200 mg/m^2) (Dodds et al. 1998). Dodds' mean Chl-a refers to seasonal means for a 2 to 3 month period in a single year. Maxima in some regions may occur in the late fall or early spring when canopy coverage is reduced. Seven of the stations exceeded or were within a

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threshold level for nuisance algal conditions suggested by Welch (1988) (100-150 mg Chl-a/ m^2). The upper level of this threshold (150 mg/m^2) was chosen to represent nuisance conditions in the Wissahickon Creek. Dodds' mesotrophic-eutrophic maximum Chl-a boundary (200 mg/m^2) would not have included station W-NW, which had dissolved oxygen violations and high percent macroalgae coverage. Dodds' mesotrophic-eutrophic mean Chl-a boundary would have included station P-MR, which represented the best overall biology in the survey. All stations exceeded EPA's recommended guidelines for Chl-a (20 mg/m^2) for Nutrient Ecoregion IX.

Ash Free Dry Mass (AFDM) ranged from 1.04 mg/cm^2 at station W-GA to 6.25 mg/cm^2 at station S-TR (Fig. 5). Large variation between station transects made the AFDM data a less reliable measure of periphyton standing crop than Chl-a concentrations (Appendix 2).

The autotrophic index (AI) ranged from 250 at station W-GA to 103 at station W-PR. Intra-station AFDM variability limited significant differences among stations (Appendix 2). AI values typically range from 50 to 200 (WEF, 1995). Values greater than 200 are indicative of poor water quality where heterotrophic processes dominate the periphyton community. Mean AI values provide evidence of organic pollution at three stations. Station T-GH, a stormwater influenced station had an AI value of 206. Station S-TR, located 0.7 miles downstream from the Abington Township STP, and station W-GA, located 0.4 miles downstream from the Ambler Borough STP had AI values of 241 and 250 respectively. AI values at these stations were not significantly different than station P-MR, which had an AI of 180. Station W-GA had a significantly higher AI than station W-WA . Other data and observations provide further evidence of organic pollution at or near stations S-TR and W-GA : 1) Water column BOD concentrations were elevated at station S-TR (20 day) and station W-GA (5 day and 20 day). 2) Average % DO Saturation was low at station S-TR (75%) and W-GA (81%), and although results are not directly comparable because the diel survey was conducted on different dates, % DO saturation decreased from 94% at station W-WA to 81% at station W-GA. 3) Macroinvertebrate communities in Sandy Run, 0.15 miles downstream from the Abington Township STP were dominated by the black fly *Simulium* (66%) and the organic pollution tolerant red midge *Chironomus* (28%) (Everett, 1998, internal DEP data, UW Program), and 4) Light brown organic solids were noted in depositional areas at station W-GA. These solids were not noted at W-WA and were likely attributable to the Ambler Borough STP discharge. AI values and BOD concentrations were not significantly correlated ($p > 0.05$). Excluding station W-NW, which had a low AI value relative to % DO saturation, AI values and % DO saturations were significantly negatively correlated ($p < 0.05$), suggesting a causal response to heterotrophic benthic biomass. High intra-station AI variance and a high AI value at the biologically unimpaired station P-MR (Everett, 1997, internal DEP data, UW Program) limits the ability to reach strong conclusions relative to the AI. However, based upon AI values, DO saturation, macroinvertebrate data and visual observation, organic enrichment does appear to negatively impact benthic communities at stations W-GA and S-TR.

Duplicate Chl-a and AFDM data showed that field and laboratory methods had good precision. Coefficient of variations for Chl-a and AFDM duplicate data were < 3% and <8% respectively (Appendix 3).

Diatom Flora

Metric scores for diatom assemblages were compared qualitatively (Table 3). Stations P-MR and W-73 had the best diatom assemblage exhibiting : highest number of taxa, highest diversity, best evenness (low % dominant), and a lower percentage of motile species. Treweylln Creek's (T-GH) diatom community was poorest, having the lowest number of taxa, lowest diversity,

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lowest evenness, and highest percentage of motile species. Metric scores indicate that stations S-TR and W-NW were also among the poorest stations. TDI values were all high and ranged narrowly from a low of 76% (W-BM) to a high of 92% (W-GA). Based upon the TDI, all sites are considered eutrophic with the diatom flora indicative of high to very high nutrient concentrations.

Rapid Periphyton Survey

Percent macroalgae coverage ranged from 3% at station P-MR to 95% at station W-NW (Fig. 6). Prophecy Creek (P-MR) had percent macroalgae coverage that was significantly lower ($p<0.05$) than percent coverage at 5 stations (T-GH, W-NW, W-PR, W-WA and W-73). Three stations had excessive coverage of filamentous algae with coverage exceeding 70% of the streambed examined. Station S-TR was not included in statistical analysis because moss was included in the macroalgal coverage estimate. The summed coverage of moss and filamentous algae at station S-TR (57%) is high relative to that found at P-MR or in the Lower Wissahickon (W-BM, W-RA). A macroalgae coverage of greater than 40% has been suggested as a nuisance algae threshold that indicates nutrient or organic enrichment (Biggs 1996).

Average maximum filamentous algae lengths ranged from 2.2 mm at station W-GA to 113.9mm at station (W-NW). Prophecy Creek (P-MR) had a maximum algal length (11.7 mm) that was significantly lower ($p<0.05$) than the maximum algal length found at 5 stations (T-GH, S-TR, W-NW, W-PR, and W-73). Four sites, T-GH, S-TR, W-NW and W-PR had excessive lengths with maximum lengths exceeding 50 mm.

Aquatic Macrophyte Survey

Five aquatic macrophyte taxa were found during the survey (Table 4). Moss was found at five stations and was the most commonly encountered macrophyte. Based upon AFDM results, moss at stations S-TR, W-NW, and W-GA may contribute significantly to productivity within the reaches.

Results Summary

Quantitative standing crop results and semi-quantitive macroalgae results were compared utilizing correlation analysis (Appendix 5). Chl-a and AFDM were significantly positively correlated ($p < 0.01$), and percent macroalgae coverage and maximum macroalgae length were significantly positively correlated ($p< 0.01$). Macroalgae coverage and length were positively correlated with Chl-a, but the correlations were not significant ($p>0.05$). The methods comparison suggests that the macroalgae survey cannot be used as a surrogate for standing crop, but does provide objective measurements that could be used as part of a screening procedure to prioritize more quantitative analysis.

Figure 7 graphically shows station differences based upon principal components analysis of selected physicochemical and biological variables (Appendix 4). Principal component axis 1 (PCA1) had high negative loading coefficients for nutrients, conductivity, and metals and accounted for 34% of the total station variance. Generally, Sandy Run (S-TR) and the main stem stations in the Upper Wissahickon exhibited high nutrients, high conductivity and high metals that are attributable to point source discharges. Lower Wissahickon Watershed stations showed improving water quality condition compared to Sandy Run and the Upper Wissahickon main stem stations. The two tributary streams that are not impacted by treated sewage discharges had the lowest concentration of nutrients and metals. Principal component axis 2 (PCA2) accounted for 21% of the total variance between stations and had high positive loading coefficients for Chl-a and high negative loading coefficients for percent canopy coverage and hardness. PCA2

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illustrates the strong negative relationship between periphyton standing crop (Chl-a) and canopy coverage. Stations with low percent canopy coverage (S-TR, W-NW, W-73, and T-GH) had higher Chl-a concentrations, whereas stations with high percent canopy cover (W-GA, W-BM, P-MR) had lower Chl-a concentrations. Percent canopy coverage (independent variable) and Chl-a (dependent variable) are significantly negatively related ($p<0.005$, $r^2 = 0.71$) (Fig. 8).

The relationship between nutrients (dependent variable) and chlorophyll-a (independent variable) was examined separately for open canopy and closed canopy stations. The separation between open canopy and closed canopy stations was distinct, with the exception of one intermediate station (W-RA). Five stations had % canopy covers less than 25% and four stations had % canopy covers greater than 38%. The intermediate station (32% canopy cover) was included with open canopy sites because of similar Chl-a concentrations (> 150 mg/m^2). Chl-a concentrations at open canopy sites were positively related to TRP and inorganic N (Figs. 9 and 10). This relationship was significant for inorganic N ($r^2=0.66$, $p<0.05$) but not significant for TRP ($r^2=0.41$, $p>0.05$). Nutrients and Chl-a were not related at closed canopy stations.

Average diel DO swings were greatest at sites having less canopy coverage located in the headwaters of Sandy Run and Wissahickon Creek, and accordingly were significantly negatively correlated ($p< 0.05$) with % canopy coverage and stream width (Appendix 6). The positive correlation of TRP with Inorganic N ($p<0.01$) and BOD_{20}($p<0.05$) was expected because water quality is effluent dominated throughout much of the main stem Wissahickon and Sandy Run.

Discussion

Wissahickon Creek and Sandy Run are influenced by point source discharges from sewage treatment plants and have very high concentrations of nutrients. Nutrient concentrations at all Wissahickon Creek stations and Sandy Run station S-TR indicate that nutrients are available in nonlimiting supplies for the development of excessive algal standing crops if light is nonlimiting. Benthic Chl-a concentrations were greater than 175 mg/m^2 for all open canopy stations, indicating nuisance levels of algae (Welch et al 1989, Biggs 1996). The positive relationship between Chl-a and inorganic N at open canopy sites illustrates that increasing nutrient concentrations will cause Chl-a to increase even when nutrient concentrations are extremely high. Zones of relatively stationary water (boundary zones) that develop within periphyton communities can reduce the input of nutrients to the community (Mullholland 1996). Nutrient uptake and subsequent depletion within the periphyton boundary zone are probably responsible for the positive biomass response to increasing inorganic N concentrations at stations with high Chl-a concentrations. Schubert's (1996) *Selenastrum capricornutum* Printz Algal Assay Bottle Test found Wissahickon surface water from four point source influenced main stem stations to be nonlimiting with respect to N and P concentrations. Schubert's study is consistent with the present study, because the Printz Algal Assay is performed with a phytoplanktonic alga in well mixed vessels and, therefore, no nutrient depleted boundary zone would be expected. Biomass at station T-GH was high suggesting that relatively low nutrient concentrations are required for accrual of high algal standing crop when canopy coverage is low. Storm water nutrient concentrations were not sampled, but may help explain the large algal biomass at station T-GH.

Table 7 presents an ecoregion (64) specific summary of nutrient data for ambient reference streams and the Wissahickon Water Quality Network Station. Wissahickon Creek near its mouth, where nutrient concentrations are lower than in the upper watershed, has inorganic nitrogen levels several times higher than reference streams (except Muddy Creek), and total phosphorus concentrations 18 to 25 times higher than reference streams. Ratios of N:P suggest that algal communities in Ecoregion 64 streams that are minimally impacted by anthropogenic

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pollution and have similar geology to the Wissahickon Watershed are phosphorus limited (Borchardt 1996). While N:P ratios in natural stream conditions are helpful when discussing restoration efforts, the N:P ratio shown for Wissahickon Creek is irrelevant because nutrients are present in overwhelming supply.

Diatom assemblages have proven to be reliable indicators of water quality (Barbour 1999) and may be better predictors of eutrophication than standing crop when hydrologic disturbance is high (Kelly 1996). The Trophic Diatom Index classified all stations as eutrophic, indicating that nutrient levels are sufficient to sustain high algal biomass with adequate light. TDI scores for Prophecy Creek conflict with other indicators (nutrients, Chl-a, other diatom metrics, macroinvertebrates), which suggest fair to good conditions. Generally, weighted average phosphorus indices utilizing diatoms provide good separation of stream trophic states (Don Charles, ANSP, personal communication). The assemblages indicative of the poorest water quality were found at stations T-GH, S-TR, and W-NW. These stations also had correspondingly high benthic algal biomass and % coverage of macroalgae. Some stations (W-73, W-BM) had metric scores that conflicted with other measures of station health (nutrients, biomass, % canopy cover).

Three stations, T-GH, W-NW and W-PR, had macroalgae coverage greater than the 40% threshold that had been related to aesthetic nuisance levels of algae (Biggs 1996). Moss was included in coverage estimates for station S-TR. Moss and macroalgae coverage combined exceeded 40 % for this station.

Nutrients, excessive biomass accrual and floral community shifts can cause water quality problems (Dodds and Welch 2000) and changes in macroinvertebrate community structure (Mason 1996). NIER's diel dissolved oxygen data shows large DO swings and violations of Chapter 93 Criteria at stations S-TR and W-NW. Everett and Ateyeh (1999, nonreported DEP data) found substantial DO swings and minimum DO violations at S-TR, W-NW, W-GA and W-73 indicating excessive in-stream biomass. Many macroinvertebrates that are sensitive to organic pollution require high dissolved oxygen. Past macroinvertebrate surveys in the Wissahickon Creek have found few sensitive EPT genera and communities that are facultative with respect to organic pollution (Boyer 1997). Nutrients, light, and resultant biomass accrual and low dissolved oxygen are in part responsible for impaired macroinvertebrate communities.

Community shifts from low growing diatoms to filamentous green algae and stalked or filamentous diatoms are associated with increasing nutrients and biomass (Biggs 1996). Some filamentous chlorophytes are too large for macroinvertebrates to effectively graze (Steinman 1996). Therefore, abundances of macroinvertebrates may be altered by algal community shifts, with a reduction in grazer feeding groups and an increase in filter collectors that can utilize sloughed filamentous algae. Algal community shifts in Wissahickon Creek may negatively impact macroinvertebrate assemblages by altering food quality.

Chl-a showed a strong negative relationship with percent canopy coverage, suggesting that when N and P are present in nonlimiting concentrations, riparian canopy cover and resultant shading limits standing crop. A preliminary assessment of paired forested and nonforested sites within the Southeastern Pennsylvania piedmont physiographic province showed larger Chl-a standing crops (8X to 77X) for unforested reaches than for forested reaches in urbanized watersheds (> 50% urban) (Hession et al 2000). A nonforested reach in a largely forested watershed (> 70% forested) (Beaver Run, HQ-TSF) showed a Chl-a standing crop that was 2.5 times higher than the standing crop found in the forested reach. However, both Chl-a concentrations in Beaver Run represented oligotrophic conditions. Diatom floras in the unforested reaches were found to have lower diversity and evenness.

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The relationship between percent canopy coverage and Chl-a for the Wissahickon Watershed would indicate that percent canopy coverage, as measured with the spherical densiometer, would need to be > 53% in order to achieve Chl-a concentrations below Dodds' mesotrophic-eutrophic mean Chl-a boundary of 70 mg/m^2. Riparian reforestation on 1st, 2nd, and 3rd order streams where canopy can overreach the channel (ex. Trewellyn Creek) should provide benefits by decreasing nuisance algal conditions and restoring a more natural benthic flora. Reduction of filamentous chlorophytes should also benefit macroinvertebrate and fish communities by providing more easily used food resources and higher dissolved oxygen concentrations. Wider stream reaches (4th order) would not benefit as greatly from shading, but riparian buffers could still provide an important light limitation function. Department biologists frequently note large aerial cover of long stranded filamentous green algae in streams that indicate potential eutrophication. The rapid periphyton survey in combination with nutrient sampling could provide a quick semi-quantitative method for describing benthic algal conditions. While not significantly correlated with Chl-a in this study, percent macroalgae coverage and maximum macroalgae length were positively correlated with standing crop. Two of the sites, which had the highest maximum macroalgae lengths, also had dissolved oxygen violations and high Chl-a standing crops indicative of eutrophic conditions.

Conclusions

1. Based upon suggested eutrophication criteria from current literature and Pa DEP Water Quality Standards for dissolved oxygen, the Wissahickon Creek and Sandy Run are eutrophic, exhibiting high nutrients and causal biological responses (Chl-a, macroalgae coverage, TDI, and DO) (Table 8).
2. Benthic algal standing crop (Chl-a) was negatively related to percent canopy cover, illustrating the importance of riparian vegetation in limiting biomass when eutrophication potential (ie. nutrients) is high. The Wissahickon Watershed's fair to good existing riparian corridors are protecting the stream from more widespread nuisance algal conditions and DO violations that could further erode ecological health.
3. Autotrophic index values, BOD concentrations, % DO saturation, and visual observations from the present study along with macroinvertebrate data from other DEP assessments provide evidence that organic enrichment negatively impacts benthic communities at stations S-TR and W-GA.
4. Trewellyn Creek station T-GH, a storm water influenced station, had high benthic algal standing crops (Chl-a), but low to moderate base flow nutrient concentrations (Ing.N = 222ug/l, TRP = 50 ug/l), suggesting these nutrient levels can maintain nuisance benthic standing crops with adequate light. This is in agreement with other studies (Borchardt 1996, Welch et al 1989) and would suggest low nutrient concentration goals for stream restoration.
5. Rapid periphyton assessments may provide a good semi-quantitative screening tool for Department biologists in determining stream segments that require additional biomass or community biological sampling.

Recommendations

1. This study supports the listing of Wissahickon Creek on the Pennsylvania 303d list for nutrients. TMDLs should be developed and implemented for nutrient reduction in the Wissahickon Watershed. Past Department studies and NIER's base flow water quality

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report indicate that point sources account for the majority of nutrient loading in the Wissahickon Watershed.

2. Riparian reforestation and maintenance of existing buffers should be encouraged throughout the watershed. Generally, the lower main stem Wissahickon Creek including stream segments in Fort Washington State Park and Fairmount Park have good riparian buffers (personal observation). Ecological and water quality benefits of riparian buffers are scientifically defensible. Riparian buffers should be protected in the Departments Rules and Regulations (Chapter 105).
3. The Department will be required to develop nutrient criteria, including response criteria (e.g. Biomass, DO) by 2003. Including periphyton (standing crop and community indices) in criteria development would provide a more direct trophic link between nutrients and biological impairment. Development of protocols, a monitoring program, and an index of biotic integrity for periphyton would provide the Department with another assessment tool that could supplement macroinvertebrate and fish data.
4. The contribution of organic enrichment to stream impairment should be evaluated further for stream segments located downstream from Ambler Borough STP and Abington Township STP.

Acknowledgments

The writer thanks Gary Jones (DEP Bureau of Laboratories) for Chl-a and AFDM analysis, and Natalie West (ANSP Intern) for diatom identification, enumeration and interpretation of the TDI. Dr. Don Charles (Phycology Section Leader, ANSP), Dr. Eduardo Morales, and Dr. Marina Potapova mentored Natalie West and provided diatom metrics, diatom metric results, and answers to several questions regarding the diatom data. Dr. Win Fairchild reviewed a draft of the report and provided helpful comments. Pa DEP Water Pollution Biologists Mike Boyer, Steve Schubert and Allen Whitehead, and Watershed Coordinator Nancy Crickman assisted with field work. Jean Kozul P.G. (NIER) provided chemical data including raw diel sonde data. Lance Butler (Biologist, Philadelphia Water Department) performed the principal components analysis. Natalie West's diatom work was funded by NSF as part of the REU student intern program. NIER chemical sampling was funded by EPA Grant No. X-93572001-0.

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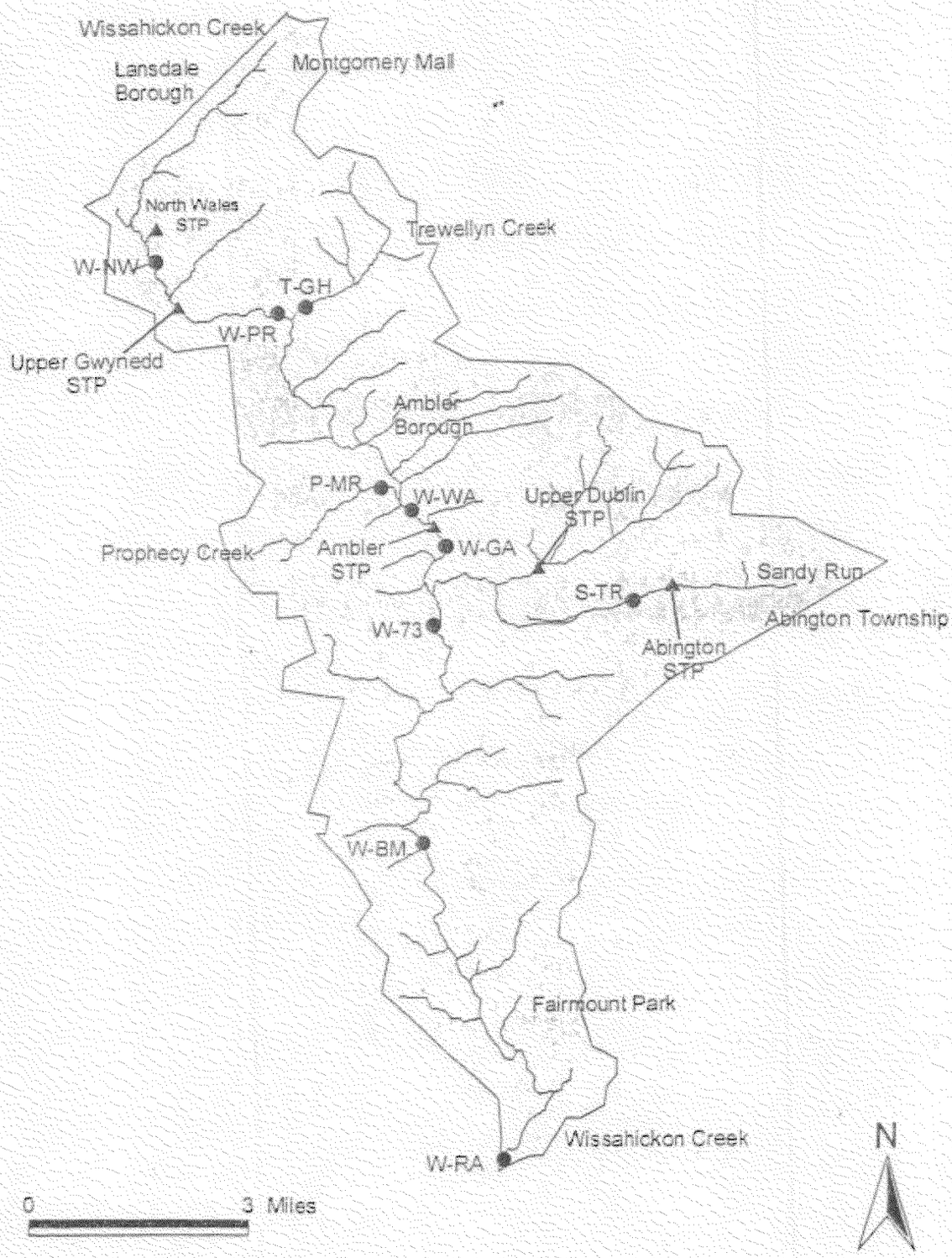

Figure 1. Wissahickon Creek Watershed. Locations of 10 sampling sites on Prophecy Creek, Trewellyn Creek, Sandy Run, and Wissahickon Creek are shown.

Table 1. Station Locations with corresponding NIER station IDs.

DEP/ANSP Station	NIER Station	River Mile	Latitude	Longitude	Location
P-MR	NIER-P	0.3	40.1520	-75.2311	Prophecy Creek near confluence with Wiss.
T-GH	NIER-T	0.2	40.1877	-75.2532	Trewellyn Creek at Gypsy Hill Rd. Bridge
S-TR	NIER-SR2	3.5	40.1269	-75.1686	Sandy Run at Twinning Rd. Bridge
W-NW	NIER-4	19.3	40.1988	-75.2895	Wissahickon at North Wales Rd. Bridge
W-PR	NIER-6A	16.9	40.1863	-75.2550	Wissahickon at Plymouth Rd. Bridge
W-WA	NIER-10	12.7	40.1469	-75.2260	Wissahickon at WVWA
W-GA	NIER-11	12.0	40.1392	-75.2170	Wissahickon at Morris Rd. Bridge
W-73	NIER-12	10.6	40.1238	-75.2209	Wissahickon at Rt. 73
W-BM	NIER-15	6.1	40.0793	-75.2260	Wissahickon at Bells Mill Rd. Bridge
W-RA	NIER-20	0.1	40.0144	-75.2073	Wissahickon at Ridge Ave Bridge

Table 2. NIER Wissahickon base flow water quality sampling : diel dissolved oxygen and temperature results for periphyton survey stations.

	Dates	n	Avg. Temp °C	Avg. DO mg/l	Avg. DO Sat. %	Avg. Diel Swing (mg/l)	Min. DO mg/l	Max. DO mg/l
P-MR	not sampled							
T-GH	not sampled							
S-TR	8/1/98 to 8/16/98	14	23.2	6.42	75	5.60	**3.09**	10.41
W-NW	8/4/98 to 8/16/98	13	22.8	**4.16**	49	5.90	**1.34**	6.92
W-PR	9/15/98 to 9/29/98	15	21.3	7.90	90	3.67	5.64	12.06
W-WA	7/30/1998 to 8/16/98	18	23.5	7.95	94	3.97	5.25	11.74
W-GA	8/26/98 to 9/8/98	14	22.7	6.98	81	2.72	5.25	9.39
W-73	7/30/98 to 8/16/98	17	23.0	6.81	80	3.15	4.98	9.35
W-BM	7/31/98 to 8/7/98	8	21.9	8.27	95	1.74	7.04	10.17
W-RA	9/16/98 to 9/29/98	14	20.0	8.78	97	3.20	7.11	12.38

Where : highlighted data are violations of Chapter 93 Water Quality Standards

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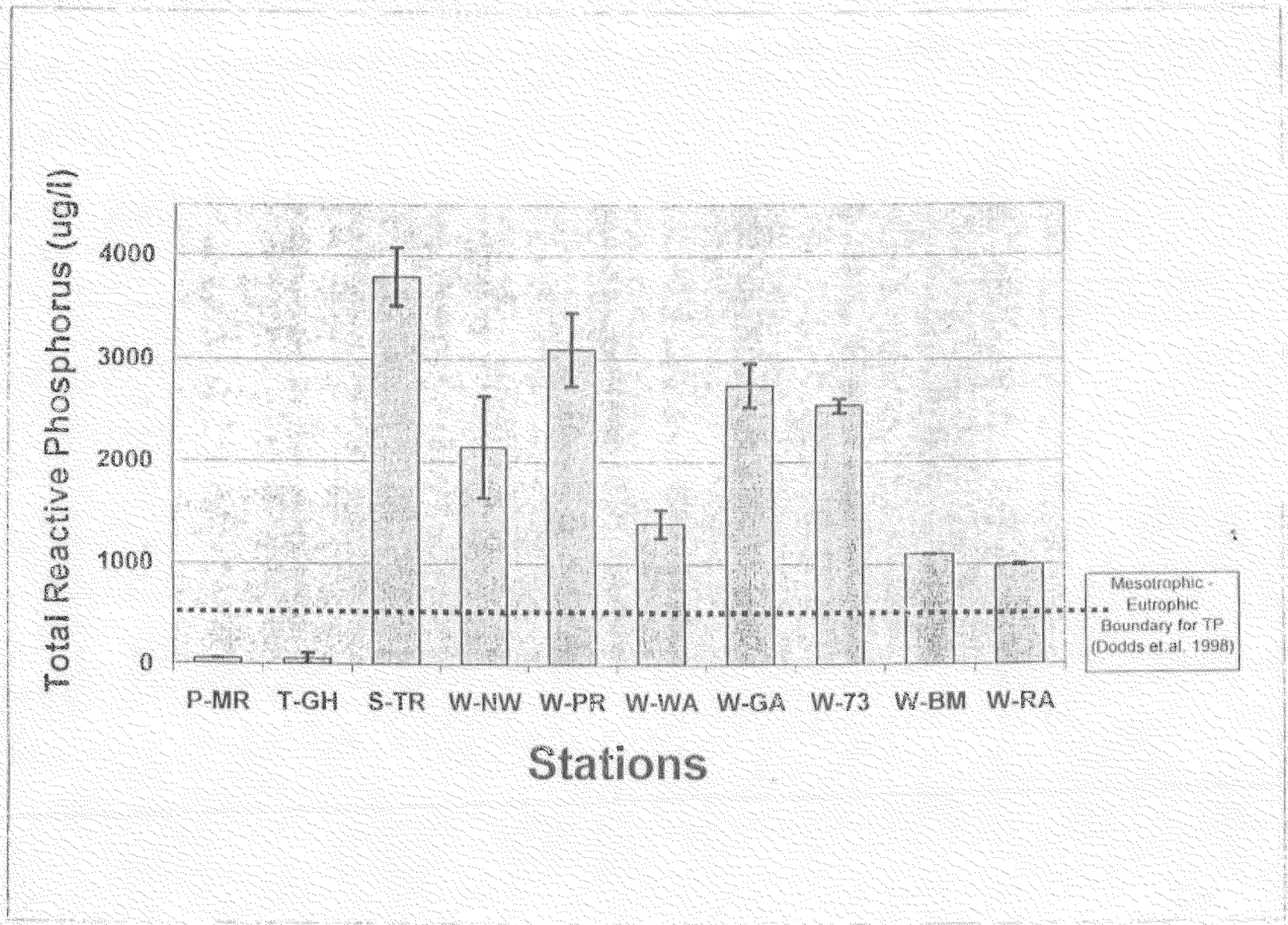

Figure 2. Total reactive phosphorus concentration (mean +/- 1SE) for stations. Suggested mesotrophic-eutrophic boundary for TP shown as dotted line (= 75 ug/l).

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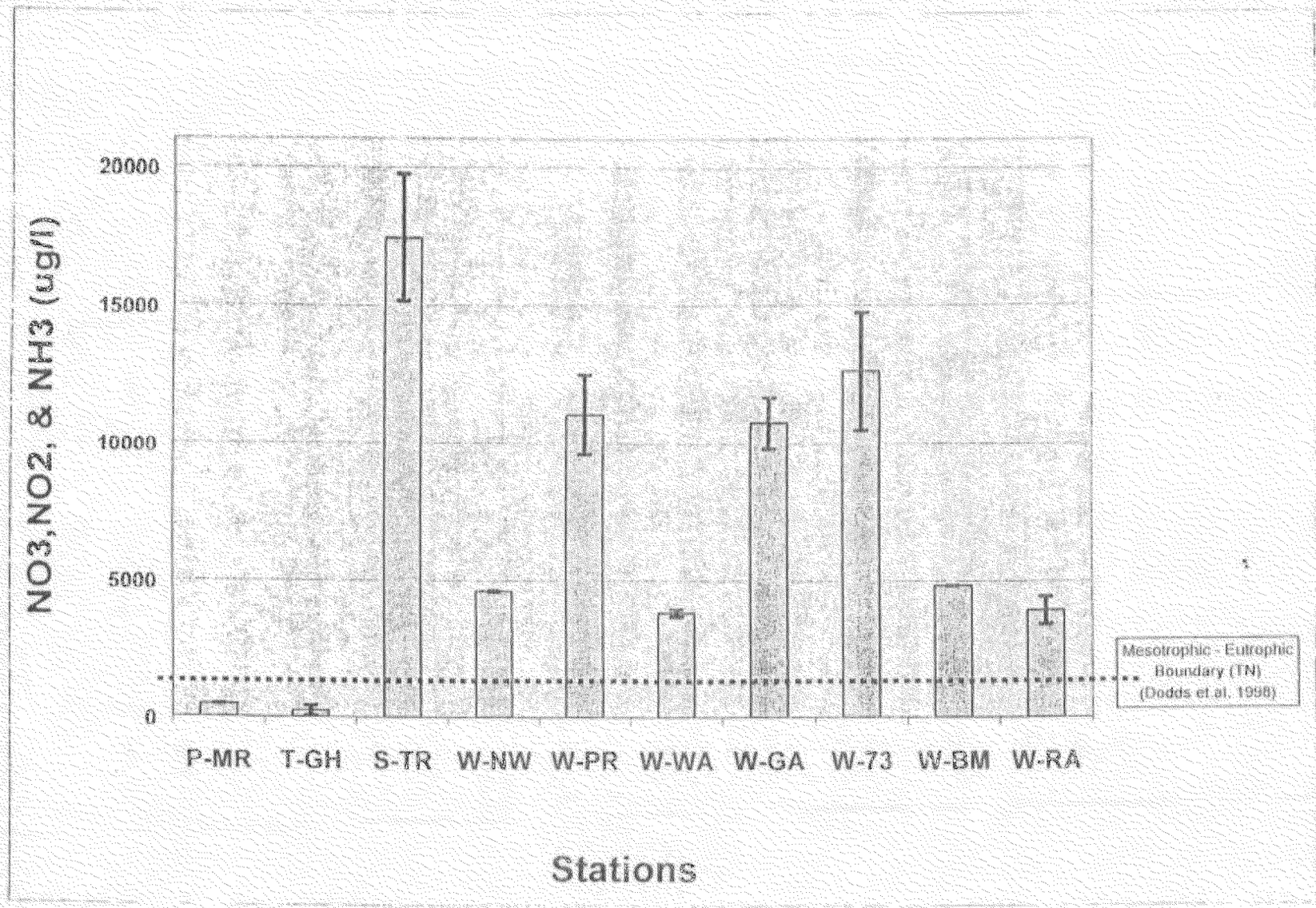

Figure 3. Inorganic nitrogen concentration (mean +/- 1SE). Inorganic nitrogen = $NH_3 + N0_3 + NO_2$ Suggested mesotrophic-eutrophic boundary concentration for TN shown as dotted line (= 1500ug/l)

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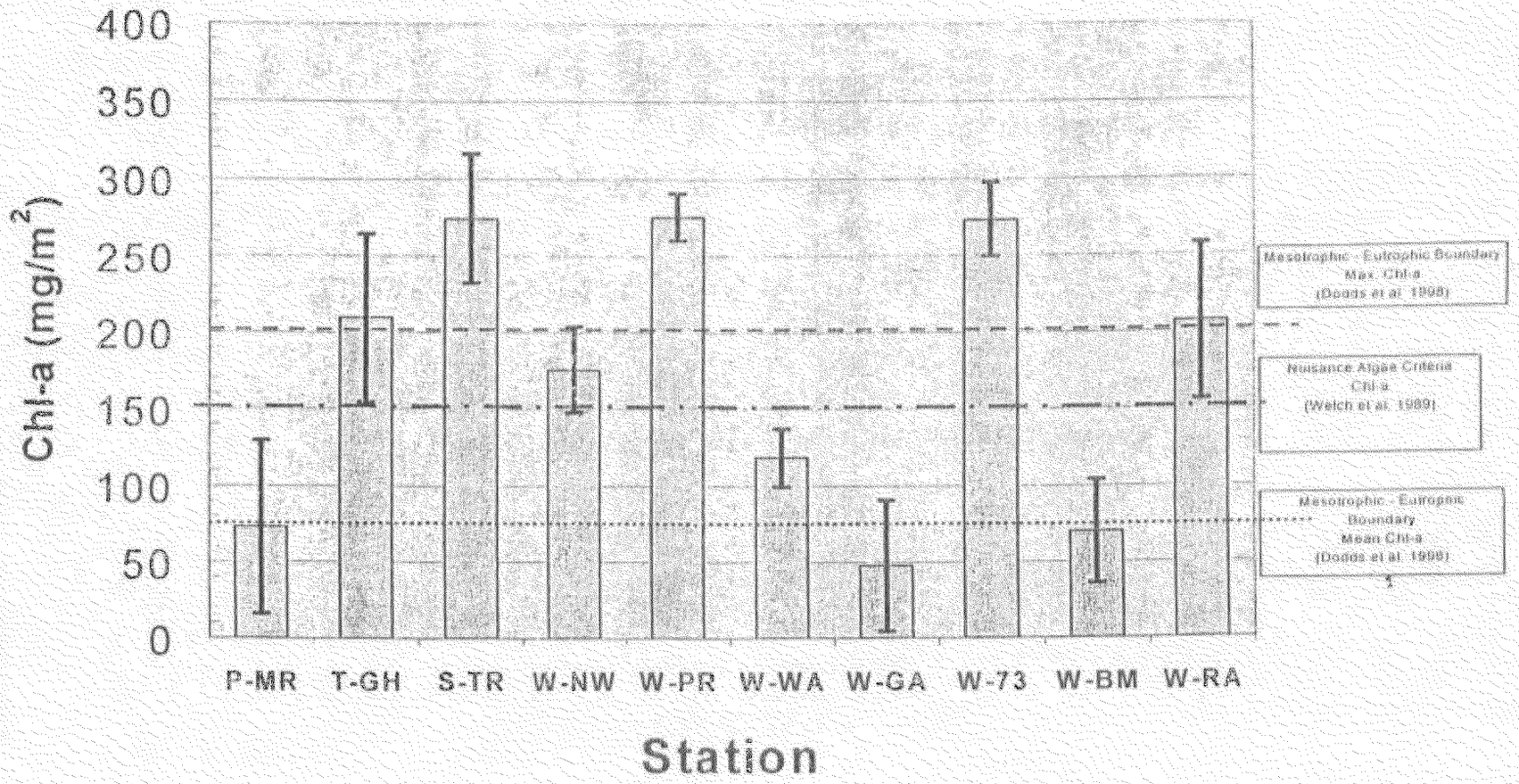

Figure 4. Periphyton standing crop as Chlorophyll-a (mg/m^2) (mean +/- 1SE, n=3). Suggested mesotrophic-eutrophic boundary for maximum chl-a shown as dashed line (= 200 mg/m^2). Suggested boundary for nuisance algal conditions shown as dash-dot line (= 150 mg/m^2). Suggested mesotrophic-eutrophic boundary for mean chl-a shown as a dotted line (= 70 mg/m^2).

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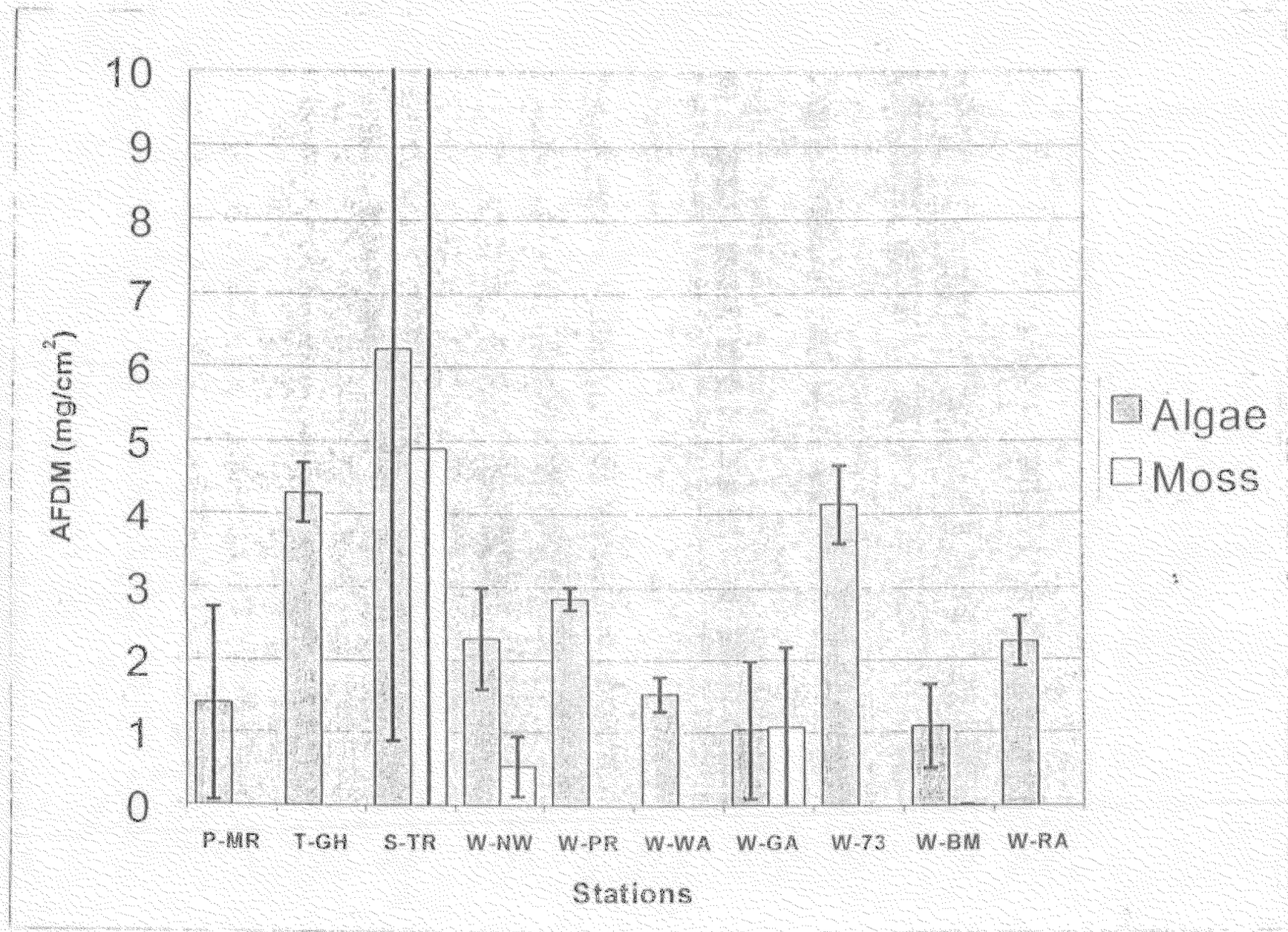

Figure 5. Periphyton and moss standing crop as AFDM (mg/cm^2), mean +/- 1SE, n=3.

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Table 3. Diatom Community Metrics. Where: TDI = Trophic Diatom Index, % Dominants = % of total diatom valves which accounted for greater than 10% of overall abundance, Siltation Index = % of motile genera (*Navicula*, *Nitzschia*, *Cylindrotheca*, and *Surirella*).

Station	Total Count	# of Taxa	TDI (%)	Shannon-Wiener Diversity Index (base 2)	% Dominants	Siltation Index
P-MR	600	42	86	3.60	27.00	0.51
T-GH	617	28	79	1.52	73.42	0.86
S-TR	602	31	83	2.41	60.63	0.72
W-NW	604	33	92	2.78	68.87	0.59
W-PR	601	35	83	2.67	53.41	0.67
W-WA	602	35	84	2.99	42.86	0.64
W-GA	611	35	92	2.88	57.61	0.51
W-73	611	48	83	3.44	27.33	0.61
W-BM	611	38	76	2.45	71.19	0.60
W-RA	609	42	85	3.20	56.81	0.48

Table 4. Aquatic macrophyte survey results. Where : * = found exclusively along stream margins, x = not found, R= rare , P = present, C = common and A = abundant.

	Station									
Aquatic Macrophytes	P-MR	T-GH	S-TR	W-NW	W-PR	W-WA	W-GA	W-73	W-BM	W-RA
Undet. Moss	x	x	A	C	x	x	C	P	P	P
Callitriche sp.*	x	x	x	P	R	R	R	R	x	x
Elodea sp.	x	P	x	P	x	x	x	x	x	x
Myriophyllum sp.	x	R	x	x	x	x	x	C	x	x
Nasturtium sp.*	x	x	C	x	C	x	x	x	x	x
Potamogeton sp.	x	x	x	R	x	x	x	R	x	x

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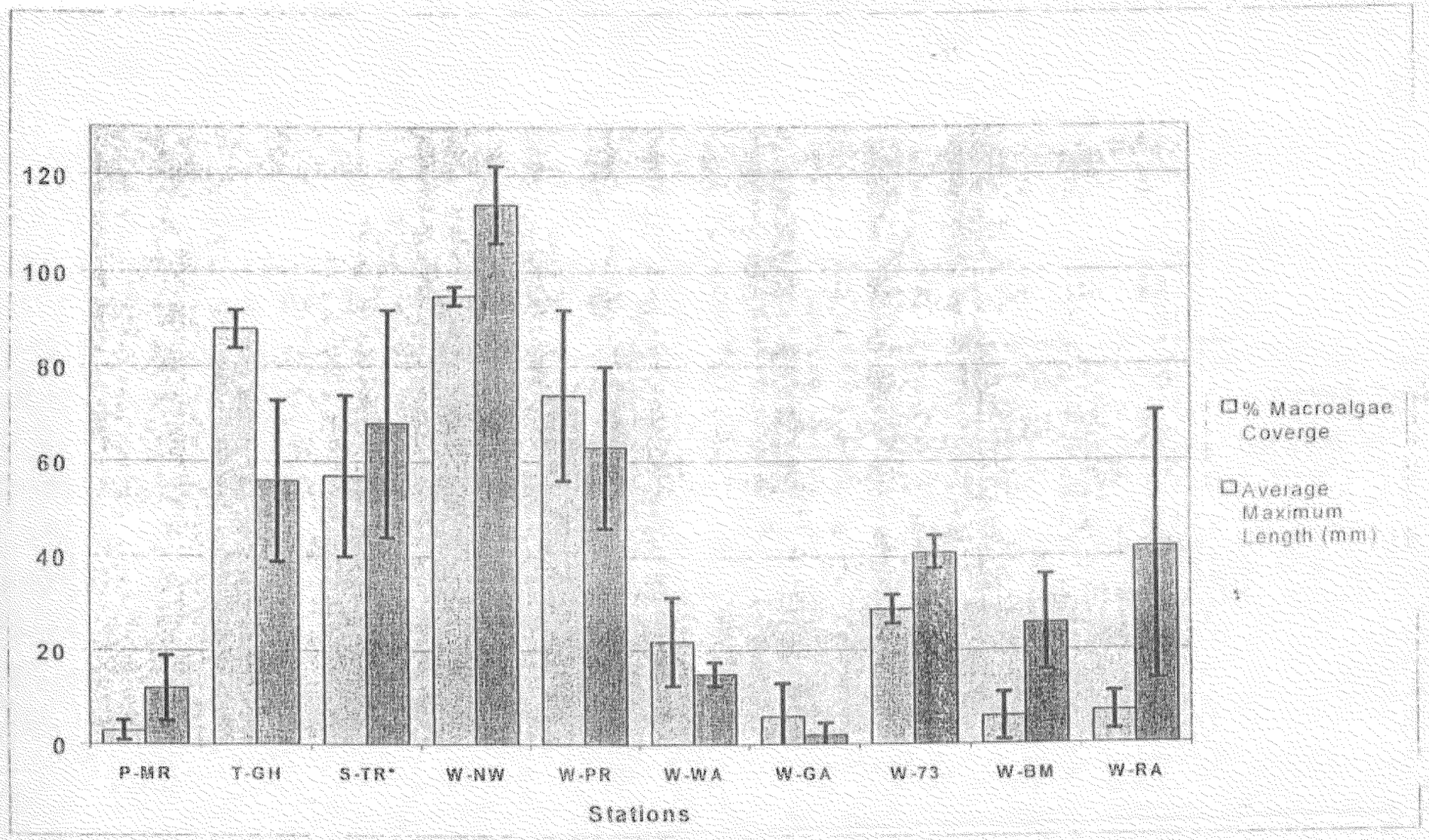

Figure 6. Results of field-based rapid periphyton survey : Percent Macroalgae Coverage (mean +/- 1SE, n=3) and Maximum Macroalgae Length (mm) (mean +/- 1SE, n=3), Where * = moss coverage included in macroalgae coverage.

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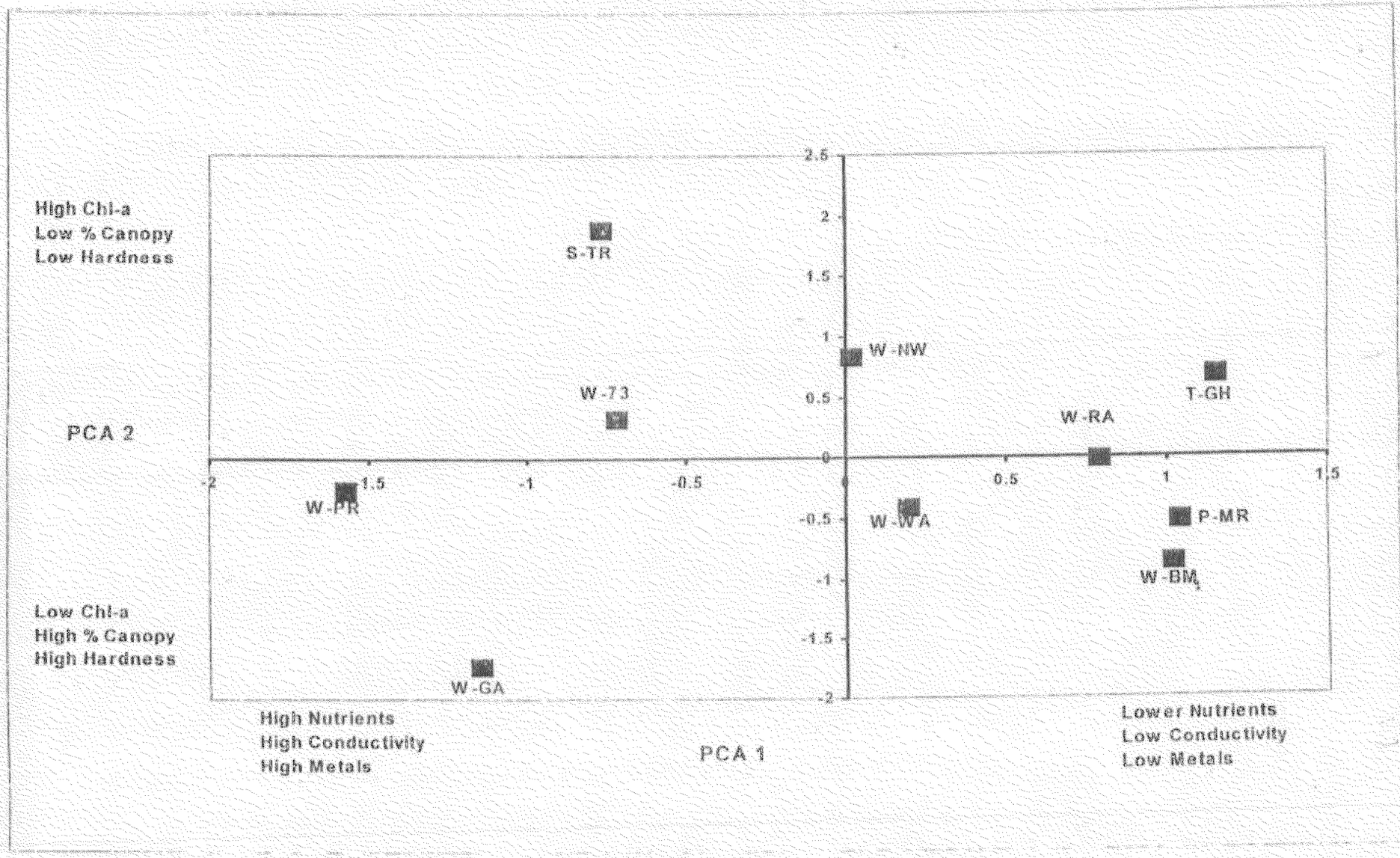

Figure 7. Principal Component Analysis of select physicochemical and biological variables. Positive and negative loading coefficients greater than 0.70 (Appendix 4) are shown on axis 1 and axis 2. PCA 1 explained 34% of total station variance and PCA 2 explained 21% of total station variance.

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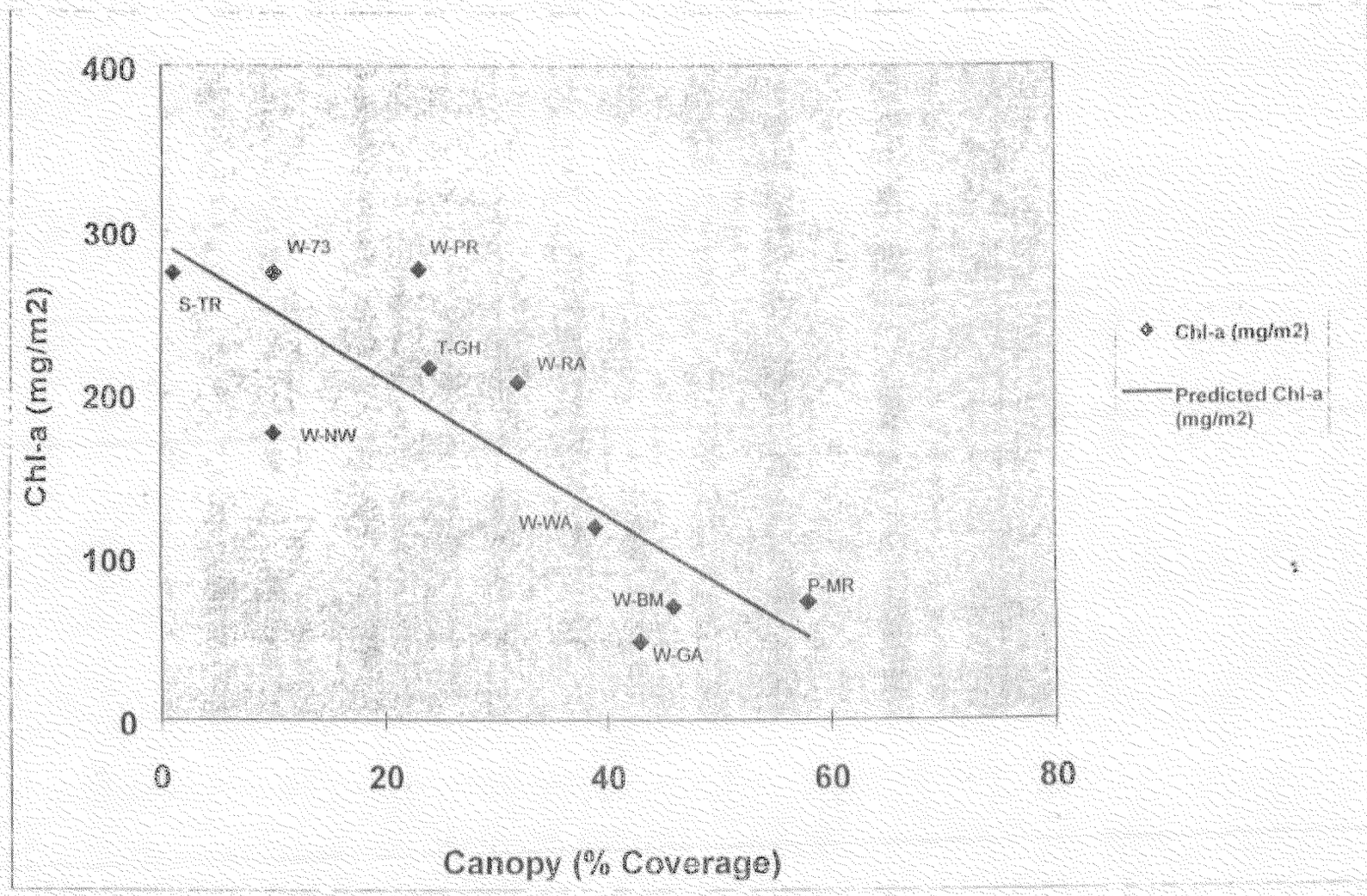

Figure 8. Linear regression showing the relationship between % canopy cover (dependent variable) and Chl-a (mg/m^2). Diamonds represent station data and line represents predicted Chl-a ($y = -4.18x + 292$, $r^2 = 0.71$, $P < 0.005$).

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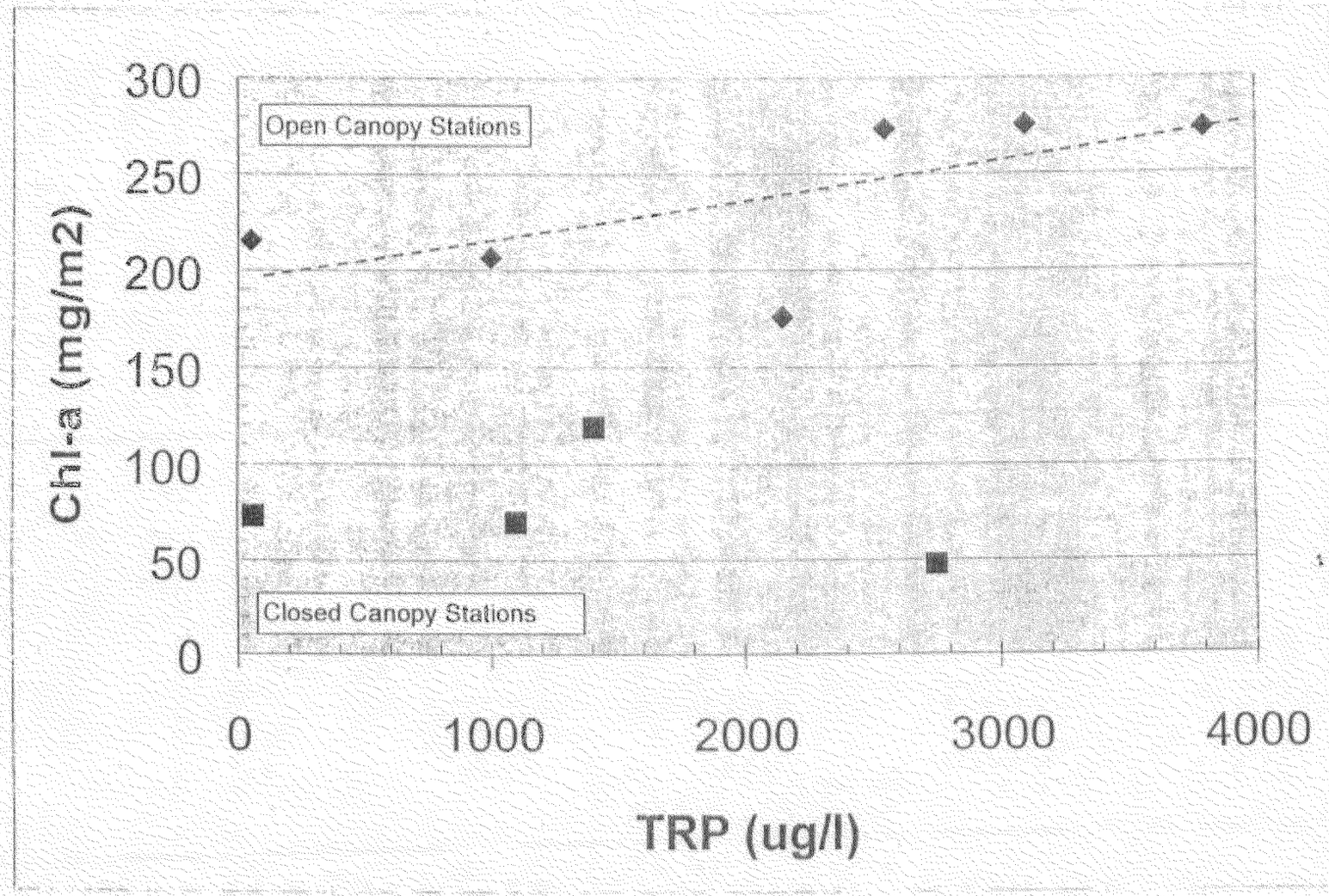

Figure 9. Relationship between total reactive phosphorus (ug/l) and chlorophyll-a (mg/m^2). Diamonds represent open canopy stations (1 to 32% canopy cover range) and squares represent closed canopy stations (39 to 58% canopy cover range). Dashed line represents predicted Chl-a ($y = 0.02x + 195$, $r^2 = 0.41$, $p>0.05$) at open canopy sites.

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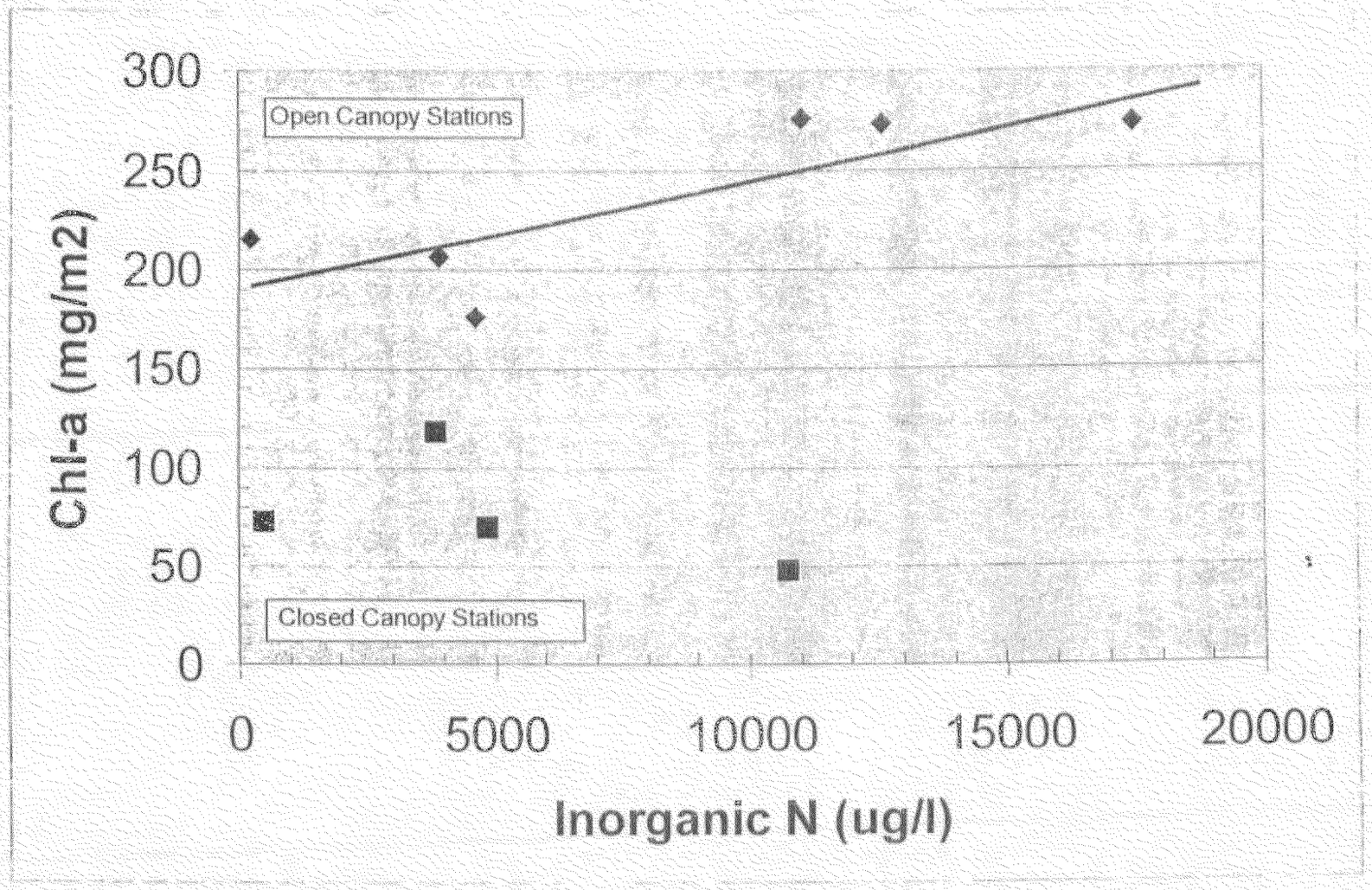

Figure 10. Relationship between inorganic nitrogen (ug/l) and chlorophyll-a (mg/m^2). Diamonds represent open canopy stations (1 to 32% canopy cover range) and squares represent closed canopy stations (39 to 58% canopy cover range). Solid line represents predicted Chl-a ($y = 0.0054x + 192$, $r^2 = 0.66$, $p < 0.05$) at open canopy sites.

Table 5. Nutrient data for ambient reference streams in Ecoregion 64 and Wissahickon Creek at W-RA (WQN 115). Concentrations represent geometric means for monthly sampling. The Wissahickon Watershed is located in three subecoregions (a,c, and d). WQN 115 is located in 64c.

Creek	Subecoregion	Yrs. of Data Acquisition	Inorganic N (ug/l)	TP (ug/l)	N:P
Cooks Creek	64d	1998-2000	1837	24	76:1
Tinicum Creek	64a	1998-2000	507	26	20:1
French Creek	64c	1999-2000	1298	28	46:1
Muddy Creek	64	1990-2000	4511	34	133:1
Wissahickon Creek*	64a,c,d	1990-2000	4200	622	7:1

Table 6. Wissahickon Creek periphyton stations compared to suggested eutrophication criteria(nutrient and biological) and Pa DEP Water Quality Standards for Dissolved Oxygen. A yes value indicates that the station exceeded the criteria. Where : ns = not sampled, * = 1998 NIER and 1999 DEP sampling, and ** = moss coverage included in macroalgae coverage.

Station	Nutrients (ug/l) TN > 1500, TP > 75 (Dodds et al. 1998)	Chl-a (mg/m^2) 150 (Welch et al. 1989)	Macroalgae Coverage > 40% (Biggs, 1996)	TDI > 67 % (Kelly, 1996)	DO (mg/l)* < 5.0 (2/15-7/31), <4.0 (8/1-2/14) (Pa DEP Chap 93)
P-MR	No	No	No	Yes	ns
T-GH	No	Yes	Yes	Yes	ns
S-TR	Yes	Yes	Yes**	Yes	Yes
W-NW	Yes	Yes	Yes	Yes	Yes
W-PR	Yes	Yes	Yes	Yes	No
W-WA	Yes	No	No	Yes	No
W-GA	Yes	No	No	Yes	Yes
W-73	Yes	Yes	No	Yes	Yes
W-BM	Yes	No	No	Yes	No
W-RA	Yes	Yes	No	Yes	No

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Appendices

ED_001523_00003568-00030

[illegible] Survey - Physical, Chemical and Biological Data.

Stations	Units	P-MR	T-GH	S-TR	W-NW	W-PR	W-WA	W-GA	W-73	W-BM	W-RA
NIER Chem. Sampling Dates		9/1	8/25, 9/1, 9/10	9/3, 9/10	8/24, 9/2	9/1, 9/10	8/25, 9/2	8/25, 9/2	9/1, 9/15	9/3	9/4, 9/11
Bio. Sampling Dates		9/11	9/15	9/14	9/10	9/15	9/11	9/11	9/15	9/14	9/14
NIER Diel Sampling Dates				8/1 to 8/16	8/4 to 8/16	9/15 to 9/29	7/30 to 8/16	8/26 to 9/8	7/30 to 8/16	7/31 to 8/7	9/16 to 9/29
Stream Order	Order	2	3	2	2	2	3	3	4	4	4
Steam Width	m	2.5	1.8	7.2	4.8	8.1	8.5	8.5	15.6	21.7	16.8
Flow (Baseflow)	cfs		0.1	5.3	1.5	2.5	4.5	11.6	16.5		30.4
Canopy (% Coverage)	%	58	24	1	10	23	39	43	10	46	32
%Boulder/Cobble	%	35	65	35	50	60	65	55	35	80	70
Total Reactive Phophorus	ug/l	60	50	3800	2150	3100	1400	2750	2550	1100	1000
Inorganic Nitrogen	ug/l	480	222	17478	4641	11050	3832	10760	12620	4840	3903
Conductivity	umhos/cm	518	379	703	575	1175	991	989	848	725	659
Hardness	mg/l	220	143	180	130	200	190	235	195	230	190
Cu	ug/l	9.0	7.5	12.8	12*	34**	12.5	23*	12.5	4.5	4.5
Fe	ug/l	24	25	33	38	125	34	49	35	17	26
Zn	ug/l	7	6	42	11	105	45	45	35	12	19
Pb	ug/l	2.0	1.7	1.0	1.0	3.0	1.5	4.0	1.5	1.0	1.0
BOD_5	mg/l	1.0	1.0	1.0	2.1	1.5	1.0	4.2	4.3	1.0	1.0
BOD_{28}	mg/l	1.0	1.0	3.2	5.9	2.5	2.4	6.6	5.1	1.0	1.0
$CBOD_5$	mg/l	1.0	1.0	1.0	1.0	1.5	1.0	2.5	1.8	1.0	1.0
Mean DO (NIER Sonde)	mg/l			6.4	4.2	7.9	8.0	7.0	6.8	8.3	8.8
Avg. DO Diel Swing	mg/l			5.6	5.9	3.7	4.0	2.7	3.2	1.7	3.2
Avg. Temp. (NIER Sonde)	°C			23.2	22.8	21.3	23.5	22.7	23.0	21.9	20.0
pH	SU	7.9	8.0	8.1	7.9	8.1	7.8	7.9	7.9	8.2	8.1
Total Solids	mg/l	1.0	2.0	1.3	0.8	1.5	3.0	6.0	12.5	4.0	3.0
Turbidity	ntu	1.1	1.3	1.5	2.2	1.2	1.6	3.6	2.5	1.9	1.5
Fecal Coliform	#/100ml	230	304	2754	437	432	624	269	348	220	62
Chl-a	mg/m^2	73	216	274	176	276	119	48	274	70	207
AFDM	mg/cm^2	1.40	4.29	6.25	2.29	2.85	1.53	1.04	4.14	1.09	2.26
Autotrophic Index		180	206	241	128	103	130	250	152	152	112
% Macroalgae Coverage	%	3	88	57***	95	74	22	6	29	6	7
Macroalgae Max. L.	mm	12	56	68	114	63	15	2	41	26	42
Trophic Diatom Index (ANSP)	%	86	79	83	92	83	84	92	83	76	85

Where : highlighted data are violations of Chapter 93 (Water Quality Standards) or Chapter 16 (Toxics).

* = Fish and aquatic life criteria (continuous)

** = Fish and aquatic life criteria (continuous and maximum)

*** = moss included in macroalgae coverage

Appendix 2. Descriptive statistics and analysis of variance for Chlorophyll-a, Pheophytin,AFDM, Autotrophic Index, Percent Macroalgae Coverage, and Maximum Macroalgae Length. Where: SD = standard deviation, CV = coefficient of variation, and V = variance, V-LT = $\log_{10}$ transformed variance.

Chl-a :Mean, SD, CV,V & ANOVA 1998 Wissahickon Periphyton Survey

	Chlorophyll a (ug/cm2)				chl-a
Station	Mean	SD	CV	V	mg/m2
P-MR	7.3	5.7	78	**32.4**	73
T-GH	21.6	5.5	25	30.8	216
S-TR	27.5	4.2	15	17.7	275
W-NW	17.6	2.8	16	8.0	176
W-PR	27.6	1.5	5	**2.2**	276
W-WA	11.9	1.9	16	3.6	119
W-GA	4.8	4.3	90	18.1	48
W-73	27.4	2.4	9	5.7	274
W-BM	7.0	3.4	49	11.6	70
W-RA	20.7	5.1	25	25.8	207

Chlorophyll a, P-values, <0.05 Highlighted

Station	P-MR	T-GH	S-TR	W-NW	W-PR	W-WA	W-GA	W-73	W-BM	W-RA
P-MR	1.000									
T-GH	**0.036**	1.000								
S-TR	**0.008**	0.213	1.000							
W-NW	**0.049**	0.321	**0.027**	1.000						
W-PR	**0.004**	0.141	0.971	**0.005**	1.000					
W-WA	0.255	**0.045**	**0.004**	**0.045**	**<0.001**	1.000				
W-GA	0.575	**0.014**	**0.003**	**0.012**	**0.001**	0.058	1.000			
W-73	**0.005**	0.168	0.973	**0.010**	0.908	**0.001**	**0.001**	1.000		
W-BM	0.935	**0.017**	**0.003**	**0.014**	**0.001**	0.094	0.529	**0.001**	1.000	
W-RA	**0.039**	0.840	0.147	0.407	0.085	**0.049**	0.014	0.105	**0.018**	1.000

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Pheophytin : Mean, SD, CV,V & ANOVA 1998 Wissahickon Periphyton Survey

	Pheophytin a (ug/cm2) Mean	SD	CV	V	mg/m2
P-MR	1.7	1.4	82	2.01	17
T-GH	2.7	0.4	15	0.19	27
S-TR	4.6	2.4	52	**5.86**	46
W-NW	4.2	1.1	26	1.17	42
W-PR	5.1	0.4	8	0.11	51
W-WA	2.0	0.2	10	**0.05**	20
W-GA	0.6	0.6	100	0.28	6
W-73	6.1	1.2	20	1.38	61
W-BM	2.1	0.8	38	0.77	21
W-RA	5.0	1.1	22	0.11	50

Pheophytin a, P-values, <0.05 Highlighted

Station	P-MR	T-GH	S-TR	W-NW	W-PR	W-WA	W-GA	W-73	W-BM	W-RA
P-MR	1.000									
T-GH	0.267	1.000								
S-TR	0.135	0.245	1.000							
W-NW	0.061	0.078	0.823	1.000						
W-PR	**0.014**	**0.001**	0.742	0.257	1.000					
W-WA	0.655	0.056	0.134	**0.023**	**<0.001**	1.000				
W-GA	0.320	**0.006**	**0.048**	**0.001**	**<0.001**	**0.015**	1.000			
W-73	**0.013**	**0.009**	0.390	0.113	0.233	**0.004**	**0.002**	1.000		
W-BM	0.584	0.377	0.171	0.056	**0.005**	0.755	0.054	**0.009**	1.000	
W-RA	**0.009**	**0.025**	0.685	0.206	0.702	**<0.001**	**<0.001**	0.280	**0.004**	1.000

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AFDM :Mean, SD, CV,V & ANOVA 1998 Wissahickon Periphyton Survey

Ash-Free Dry Mass (mg/cm2) algae

	Mean	SD	CV	V	V-LT
P-MR	1.40	1.33	95	1.78	*
T-GH	4.29	0.41	10	0.17	
S-TR	6.25	5.37	86	**28.84**	**0.12**
W-NW	2.29	0.70	31	0.49	
W-PR	2.85	0.15	5	**0.02**	**0.0006**
W-WA	1.53	0.24	16	0.06	
W-GA	1.04	0.94	90	0.88	
W-73	4.14	0.53	13	0.28	
W-BM	1.09	0.57	52	0.32	
W-RA	2.26	0.34	15	0.12	

AFDM (algae), P-values, <0.05 Highlighted (log transformed)

Station	P-MR	T-GH	S-TR	W-NW	W-PR	W-WA	W-GA	W-73	W-BM	W-RA
P-MR	1.000									
T-GH	0.061	1.000								
S-TR	0.094	0.766	1.000							
W-NW	0.260	**0.028**	0.180	1.000						
W-PR	0.138	**0.003**	0.297	0.253	1.000					
W-WA	0.528	**<0.001**	0.066	0.149	**0.003**	1.000				
W-GA	0.680	0.062	0.081	0.169	0.117	0.336	1.000			
W-73	0.067	0.684	0.708	**0.038**	**0.011**	**0.001**	0.068	1.000		
W-BM	0.924	**0.017**	0.051	0.119	**0.044**	0.306	0.701	**0.019**	1.000	
W-RA	0.235	**0.004**	0.167	0.948	0.065	**0.040**	0.176	**0.007**	0.093	1.000

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Autotrophic Index :Mean, SD, CV,V & ANOVA

1998 Wissahickon Periphyton Survey

Station	Maximum Length (mm) Mean	SD	CV	V	V-LT
P-MR	180	64	36	4100	
T-GH	206	44	21	1971	
S-TR	241	228	95	**52146**	0.1477
W-NW	128	20	16	399	
W-PR	103	4	4	**14**	0.00027
W-WA	130	32	25	996	
W-GA	250	76	30	5822	
W-73	152	29	19	837	
W-BM	152	28	18	792	
W-RA	112	17	15	301	

Autotrophic Index, P-values, <0.05 Highlighted (Log Transformed)

Station	P-MR	T-GH	S-TR	W-NW	W-PR	W-WA	W-GA	W-73	W-BM	W-RA
P-MR	1.000									
T-GH	0.550	1.000								
S-TR	0.916	0.843	1.000							
W-NW	0.314	**0.036**	0.526	1.000						
W-PR	0.106	**0.005**	0.331	0.103	1.000					
W-WA	0.356	0.061	0.544	0.954	0.188	1.000				
W-GA	0.301	0.445	0.623	**0.029**	**0.008**	**0.042**	1.000			
W-73	0.654	0.129	0.734	0.296	**0.025**	0.400	0.076	1.000		
W-BM	0.658	0.133	0.736	0.296	**0.026**	0.398	0.077	0.095	1.000	
W-RA	0.170	**0.015**	0.397	0.370	0.479	0.428	**0.016**	0.096	0.999	1.000

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Macroalgae (% Coverage) :Mean, SD, CV,V & ANOVA
1998 Wissahickon Periphyton Survey

Station	Macroalgae (% Coverage) Mean	SD	CV	V
P-MR	3.1	2.1	68	4.4
T-GH	88.0	4.4	5	19.4
S-TR*	57.3	17.7	31	311.8
W-NW	94.5	2.0	2	**4.0**
W-PR	74.0	18.0	24	**324.0**
W-WA	22.4	9.5	42	90.3
W-GA	6.2	7.1	115	50.4
W-73	29.4	3.0	10	9.0
W-BM	5.8	5.4	93	29.2
W-RA	7.1	3.8	54	14.4

* = moss was included with macro coverage estimate, sample was not included in ANOVA and correlation analyses.

Macroalgae (% Coverage), P-values, <0.05 Highlighted

Station	P-MR	T-GH	W-NW	W-PR	W-WA	W-GA	W-73	W-BM	W-RA
P-MR	1.000								
T-GH	**<0.001**	1.000							
W-NW	**<0.001**	0.082	1.000						
W-PR	**0.002**	0.261	0.122	1.000					
W-WA	**0.026**	**<0.001**	**<0.001**	**0.012**	1.000				
W-GA	0.510	**<0.001**	**<0.001**	**0.004**	0.077	1.000			
W-73	**<0.001**	**<0.001**	**<0.001**	**0.013**	0.289	**0.006**	1.000		
W-BM	0.469	**<0.001**	**<0.001**	**0.003**	0.057	0.937	**0.003**	1.000	
W-RA	0.188	**<0.001**	**<0.001**	**0.003**	0.060	0.861	**0.001**	0.749	1.000

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Macroalgae Maximum Length (mm) :Mean, SD, CV,V & ANOVA
1998 Wissahickon Periphyton Survey

Station	Maximum Length (mm) Mean	SD	CV	V
P-MR	11.7	7.3	62	53.3
T-GH	56.1	17.1	30	292.4
S-TR*	68.3	24.0	35	576.0
W-NW	113.9	8.2	7	67.2
W-PR	62.8	16.8	27	282.2
W-WA	14.5	2.5	17	6.2
W-GA	2.2	2.5	114	**6.2**
W-73	40.6	3.4	8	11.6
W-BM	25.6	10.2	40	104.0
W-RA	41.9	28.2	67	**795.2**

Macroalgae Maximum Length (mm), P-values, <0.05 Highlighted

Station	P-MR	T-GH	S-TR	W-NW	W-PR	W-WA	W-GA	W-73	W-BM	W-RA
P-MR	1.000									
T-GH	**0.014**	1.000								
S-TR	**0.018**	0.513	1.000							
W-NW	**<.001**	**0.006**	**0.036**	1.000						
W-PR	**0.008**	0.656	0.759	**0.009**	1.000					
W-WA	0.564	**0.014**	**0.018**	**<0.001**	**0.008**	1.000				
W-GA	0.102	**0.006**	**0.009**	**<0.001**	**0.004**	**0.004**	1.000			
W-73	**0.003**	0.197	0.119	**<0.001**	0.088	**<0.001**	**<0.001**	1.000		
W-BM	0.127	0.056	**0.047**	**<0.001**	**0.030**	0.141	**0.018**	0.073	1.000	
W-RA	0.146	0.496	0.284	**0.013**	0.332	0.168	0.072	0.939	0.398	1.000

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Appendix 3. Duplicate data for Chlorophyll-a, Pheophytin-a, and AFDM. Where sd = standard deviation and cv = coefficient of variation.

Wissahickon Periphyton Survey - 1998

Duplicate Data :

Sample ID	Chlorophyll a (ug/cm2)	Pheophytin a (ug/cm2)	AFDM (mg/cm2)
W-RA-C	22.40	5.90	2.73
W-RA-C dup	22.00	3.80	2.42
mean	22.2	4.9	2.6
sd	0.3	1.5	0.2
cv	1	31	8

Sample ID	Chlorophyll a (ug/cm2)	Pheophytin a (ug/cm2)	AFDM (mg/cm2)
W-PR-A	28.90	3.50	2.67
W-PR-A dup1	27.30	4.90	2.78
W-PR-A dup2	27.70	5.80	2.84
mean	28.0	4.7	2.8
sd	0.8	1.2	0.1
cv	3	26	4

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Appendix 4. Results of Principal Components Analysis for select physicochemical and biological parameters.

Eigenvalues (algae2.sta)
Extraction: Principal components

	Eigenval	% total Variance	Cumul. Eigenval	Cumul. %
1	5.861616867	34.48009922	5.861617	34.4801
2	3.528553041	20.75619436	9.39017	55.23629

Factor Loadings (Unrotated) (algae2.sta)
Extraction: Principal components
(Marked loadings are > .700000)

	Factor 1	Factor 2
STR_WIDT	0.042263006	-0.272861375
CANOPY	0.450668449	**-0.817438126**
BLDR_COB	0.359642301	-0.406362883
TRP	**-0.909575663**	0.246628879
INORG_N	**-0.834472522**	0.275940405
CONDUCT	**-0.772291472**	-0.422303987
HARD	-0.152242322	**-0.741862616**
CU	**-0.861567483**	-0.222697486
FE	**-0.734434645**	-0.121445884
ZN	**-0.830399451**	-0.117701327
PB	-0.554925789	-0.633859978
BOD20	-0.668877193	-0.045645961
TOT_SOL	-0.278792483	-0.225833471
TURBID	-0.418989085	-0.425358061
FEC_COLI	-0.337912059	0.683616571
CHL_A	-0.383116581	**0.743352658**
TDI	-0.378505773	-0.145602851
Expl Var	5.861616867	3.528553041
Prp.Totl	0.344800992	0.207561944

Factor Scores (algae2.sta)
Rotation: Unrotated
Extraction: Principal components

	Factor 1	Factor 2
P-MR	1.03755423	-0.508975435
T-GH	1.152357854	0.676308549
S-TR	-0.76702258	1.893061697
W-NW	0.018645404	0.841737171
W-PR	-1.573028937	-0.258352101
W-WA	0.193749979	-0.398551705
W-GA	-1.148745369	-1.712571585
W-73	-0.720028983	0.330428745
W-BM	1.015308724	-0.850597969
W-RA	0.791209678	-0.012487367

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Appendix 5. Pearson Product Moment Correlation matrix for standing crop measurements and macroalgae measurements. Highlighted correlations are significant (* = $p < 0.01$).

	Chl-a	AFDM	% Macroalgae Coverage	Macroalgae Max. Length
Chl-a	1.00			
AFDM	0.83*	1.00		
% Macro Coverage	0.58	0.61	1.00	
Macro Max. Length	0.62	0.49	0.85*	1.00

Appendix 6. Pearson Product Moment Correlation matrix for selected physicochemical and biological variables. Highlighted correlations are significant (* = $p < 0.05$, ** = $p < 0.01$).

	Chl-a	TDI	TRP	Inorg. N	Avg. Diel DO Swing	BOD20	Cond.	% Canopy Coverage	Stream Width
Chl-a	1.00								
TDI	-0.21	1.00							
TRP	0.44	0.29	1.00						
Inorg. N	0.48	0.10	0.95**	1.00					
Avg. Diel DO Sw.	0.47	0.45	0.47	0.24	1.00				
BOD20	0.01	0.72*	0.64*	0.52	0.31	1.00			
Conductivity	0.06	0.14	0.62	0.54	-0.32	0.33	1.00		
% Canopy Coverage	- 0.84 **	-0.04	-0.63	-0.60	- 0.77 *	-0.40	0.01	1.00	
Stream Width	-0.04	-0.39	0.10	0.19	- 0.79 *	-0.10	0.28	0.08	1.00

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Limnol. Oceanogr., 51(1, part 2), 2006, 671±680
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Eutrophication and trophic state in rivers and streams

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Abstract

Many natural streams are net heterotrophic, so I propose that trophic state be divided into autotrophic and heterotrophic state. This division allows consideration of the in¯uence of external carbon sources as well as nutrients such as nitrogen and phosphorus. Empirical results suggest that phosphorus and nitrogen are the most important nutrients regulating autotrophic state in ¯owing waters and that benthic algal biomass is positively correlated to gross primary production in streams. Reference (minimally in¯uenced by human activities) nutrient concentrations and correlations of nutrients with algal biomass are used to characterize reference distributions of stream autotrophic state. Only when reference nutrient concentrations are in the upper one third of those expected in the United States, is maximum benthic chlorophyll projected to exceed 100 mg m^{22} (a concentration commonly used to indicate nuisance levels) . 30% of the time. Average reference nutrient concentrations lead to sestonic chlorophyll concentrations above those considered typical of eutrophic lakes (. 8 mg m^{23}) less than half the time. Preliminary analysis suggests that autotrophic state is variable in small pristine streams because it is in¯uenced by canopy cover (light), but heterotrophic state is less variable because it can be based on allochthonous or autochthonous production. Nitrogen and phosphorus enrichment can in¯uence both heterotrophic and autotrophic state, and these effects could cascade to animal communities. Stoichiometry should be considered because carbon, nitrogen, and phosphorus are all involved in trophic state. The proposed de®nition of trophic state offers a starting conceptual framework for such considerations.

The evolution of concepts regarding enrichment in streams

In its course from the source to the sea, the progressive eutrophication of a river water by drainage from cultivated and inhabited districts is an almost inevitable natural process.
ÐButcher 1947

Although current concerns about stream eutrophication mainly focus on nitrogen (N) and phosphorus (P) enrichment (e.g., Smith 2003), early water quality and nutrient enrichment studies in lotic systems focused on carbon (C) enrichment from untreated sewage. Excessive loading of biochemical oxygen demand (BOD) made rivers completely anoxic downstream of sewage treatment plants. Hynes (1960) considered the physical, biological, and chemical effects of sewage loading to create a general conceptual model on the basis of the research of Butcher (1946) and others. The conceptual model of Hynes in part considered the in¯uence of increased organic C on dissolved oxygen (O_2) and subsequently on hypoxia- and anoxia-sensitive animals. He noted that most animals immediately downstream from a sewage outfall disappear under anoxic conditions and that, as O_2 enters the stream via aeration, high densities of pollution-tolerant fauna could be found. Eventually, as the in¯uence of the sewage diminished downstream, Hynes predicted a return to the clean water animal communities found upstream of the sewage outfall.

Enrichment by N and P were also considered in the Hynes model. He noted a substantial increase in ammonium, phosphate, and nitrate immediately downstream from the sewage outfall that diminished farther downstream. In the anoxic zone, the prevalence of cyanobacteria (*Oscillatoria* and *Phormidium*) and *Euglena,* and further downstream substantial biomass of *Cladophora,* were predicted. A decade later, Hynes (1970) speci®cally noted that nutrient enrichment could occur in rivers and streams as a direct result of human alteration of land use (in addition to sewage input). He described the amounts of increase in fertilizer use and made preliminary calculations of how much fertilizer might reach rivers and streams. At that time, however, Hynes documented a paucity of studies on the effects of nutrient enrichment alone but predicted that planktonic algae in large rivers would be stimulated.

There has been conceptual progress related to de®ning trophic state and characterizing lotic eutrophication on several fronts in the last three decades. Omernik (1977) proposed that various regions are expected to have distinct baseline amounts of nutrients related to geology, topography, and land uses. He described areas of the United States that would be expected to have relatively greater concentrations of nutrients in streams, and he de®ned the concept of nutrient ecoregions. The idea that a reference baseline trophic level occurs naturally in a region forms the basis of many current efforts to regulate stream nutrients. Over the last three decades, numerous research programs were designed to link nutrient enrichment to increases in autotrophic biomass in rivers and streams by methods that included the ``clay pot'' nutrient±diffusing substrata experiments, experimental

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Acknowledgments

I thank Dolly Gudder for technical assistance. Conversations with Val Smith, Jack Jones, Kirk Lohman, and Gene Welch helped formulate many of the ideas presented here. Two anonymous reviewers and Bob Hecky provided many excellent suggestions for improving the text.

I am thankful for support from the U.S. National Science Foundation Konza Long Term Ecological Research grant and award DEB 0111410.

This is contribution 04-301-J of the Kansas Agricultural Experiment Station, Manhattan, Kansas.

ED_001523_00003569-00001

stream channel enrichment experiments, whole-stream enrichments, and a de®nition of nuisance amounts of algae (Welch et al. 1988).

At a more fundamental level, there have been few attempts to de®ne the trophic state of lotic ecosystems and provide a comprehensive de®nition of eutrophication applicable to rivers and streams. Thus, I initially attempt to provide such a de®nition, and under this framework, I describe how prior research can be viewed given my de®nition.

De®ning trophic state and eutrophication in streams

The de®nition of tropic state I develop here is designed to include both autotrophic and heterotrophic components; thus, there is a ``heterotrophic state'' and an ``autotrophic state'' of a stream or river. Heterotrophic state can be de®ned as the metabolic activity of the stream (typically measured as average O_2 demand [respiration, R] during dark periods and scaled to 24 h). Autotrophic state is the gross primary production (GPP) during lighted periods (typically measured as production and scaled to 24 h). The delineation of heterotrophic and autotrophic state in ¯owing waters was pioneered by Odum (1956). I propose that eutrophication in lotic habitats be de®ned as an increase in a nutritive factor or factors that leads to greater whole-system heterotrophic or autotrophic metabolism.

Heterotrophic state and autotrophic state are not mutually exclusive; a system with substantial autotrophic activity will likely have high heterotrophic activity and certainly have high respiration. This link between autotrophy and respiration can lead to a positive correlation between respiration and GPP (Fig. 1). But, a system with more heterotrophic activity does not necessarily have more autotrophic activity (e.g., the condition obtained with high BOD loading). Thus, GPP:R can indicate the balance between heterotrophic and autotrophic state. Considering both autotrophic and heterotrophic components accounts for enrichment by organic C in addition to N and P, and accounts for the observation that lotic food webs can be based on consumption of autotrophic or heterotrophic organisms.

My proposed de®nition of lotic trophic state is based on total heterotrophic and autotrophic production and in¯uenced by emerging research on lakes. Although production of lakes has often been linked to planktonic biomass (usually expressed as chlorophyll concentrations), lakes can be net heterotrophic and highly in¯uenced by terrestrial C inputs (e.g., Cole et al. 1994). Thus, solely emphasizing autotrophic biomass might not accurately describe trophic structure in lentic ecosystems. Rivers and streams are likely to be more dominated by heterotrophic processes than lakes given their stronger linkage to terrestrial systems as a source of organic C and the greater likelihood that light is intercepted. In small streams, the riparian canopy often shades the stream bottom, turbidity greatly attenuates light in many large, well-mixed rivers, and in some streams (blackwater streams), dissolved organic C colors the water and retards primary production. In many rivers and streams, much allochthonous organic matter enters seasonally and through storm water runoff. The net production of most streams is negative (i.e., GPP:R ,

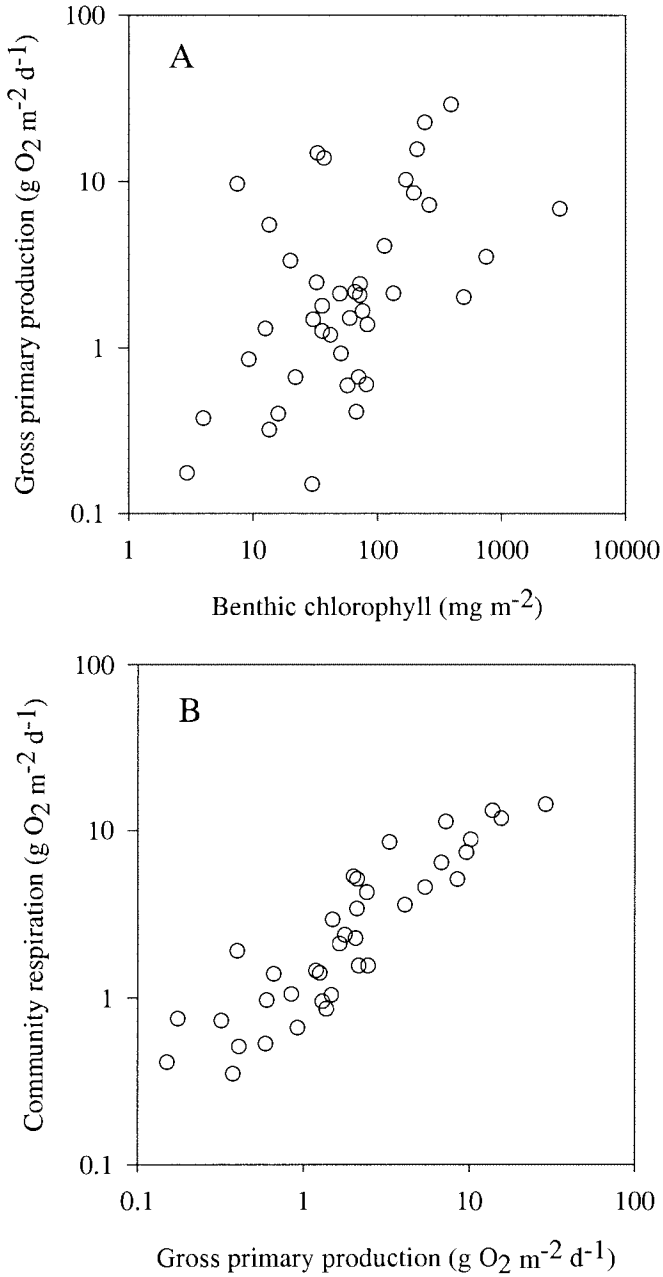

Fig. 1. (A) Relationships between benthic chlorophyll and gross primary production and (B) between gross primary production and community respiration. Data are taken from literature compiled by Bott et al. (1985); ranges were reported for values at one site, and the mean of the minimum and maximum is plotted. The relationship in (A) is signi®cant by linear regression (p , 0.05, r^2 5 0.24) and in (B) (p , 0.05, r^2 5 0.80).

1), even in open-canopy, shallow, clear-water streams (Mulholland et al. 2001). Thus, any de®nition of eutrophication in streams should consider heterotrophic activity.

Autotrophic activity can also be important in rivers and streams. Some streams with open canopies are net autotrophic (Mulholland et al. 2001). Phytoplankton production can supply a signi®cant portion of the productivity in medium to large rivers that are not highly turbid and do not com-

pletely mix because they have zones with limited water replacement (e.g., Thorp et al. 1998; Wehr and Descy 1998). Thus, allochthonous and autochthonous sources of C both should be considered, as well as inorganic and organic forms of nutrients such as N and P, when de®ning trophic status of lotic ecosystems.

Historically, trophic state in lakes was de®ned on the basis of clear delineation between anoxic hypolimnia and oxygenated waters (i.e., the difference between a mesotrophic and a eutrophic lake) and subsequent increases in the prevalence of cyanobacterial blooms, eutrophication- resistant animals, decreased water clarity, and taste and odor problems. Foremost, biogeochemical processes favor increased internal loading of P, leading to a positive feedback that stabilizes the eutrophic state with an anoxic hypolimnion (Dodds 2002). Such clear delineation of eutrophic conditions does not occur in shallow lakes, wetlands, and lotic systems for a variety of reasons.

Rivers and streams are relatively shallow and have considerably greater rates of atmospheric exchange compared with lentic systems, except under very low ¯ow conditions when they become similar to small, shallow lentic systems. Thus, it is dif®cult for biota to consume all the O_2 in the water column without substantial inputs of BOD and adequate nutrients to support very rapid rates of heterotrophic activity. Anoxia is rare in the water column of natural rivers and streams, even in forested streams under deciduous canopies immediately after leaf fall. In most lotic systems, internal loading of P and N tends to be dominated by remineralization, groundwater inputs, and erosion. Subsequently, alternative methods are required for describing trophic distributions in lotic ecosystems.

An approach that uses statistical distribution of benthic chlorophyll and water column nutrients was proposed to classify trophic state in streams given a lack of breakpoints (Dodds et al. 1998). Trophic categories by statistical distributions signify the probabilities of each trophic state. However, Dodds et al. (1998) used distributions from data sets that included affected sites; thus, the proposed categories do not represent natural trophic distributions. Many regions of developed countries completely lack such reference sites. However, a broad de®nition of stream trophic state requires consideration of the historical condition of streams before substantial modi®cation that might in¯uence heterotrophic or autotrophic state.

Which nutrients might be expected to control trophic state in lotic systems?

Before I propose trophic categories, it is important to justify which nutrients need to be considered to classify trophic state (i.e., if respiration and production are the response variables, what are the driver variables?). The most in¯uential limnologist in modern times, G. E. Hutchinson (1957), stated ``Phosphorus is in many ways the element most important to the ecologist, since it is more likely to be de®cient, and therefore to limit the biological productivity of any region of the earth's surface, than are the other major biological elements.'' This has led to the view that ``Excessive concentrations of P is [sic] the most common cause of eutrophication in freshwater lakes, reservoirs, streams, and in the headwaters of estuarine systems'' (Correll 1999). These assertions are not based on speci®c experimental and empirical observations of lotic ecosystems. How well do the data support the statement that P is the primary agent of autotrophic eutrophication in rivers and streams?

One of the common methods for assessing nutrient limitation of benthic algae in ¯owing waters is measuring chlorophyll accumulation on nutrient-diffusing substrata (e.g., Pringle et al. 1986; Winterbourn 1990). Francoeur (2001) performed a meta-analysis of 237 nutrient enrichment studies in temperate streams and found that 16.5% indicated an N response, 18.1% indicated a P response, 23.2% required N and P be added together for a response, 5% had N or P inhibition, and 43% had no response to N or P.

Tank and Dodds (2003) tested for autotrophic nutrient limitation across 10 North American streams with the use of silica (glass ®ber ®lters) or wood (thin layers of wood veneer) substrata in nutrient-diffusing agar devices. Algae responded differently to nutrients, depending on the substrata on which they were growing, and there was no primary positive response of algae to P enrichment alone at any site. No response to nutrient enrichment was a common result of these experiments, but N or N and P stimulated algal biomass at unshaded sites. The lack of nutrient response was closely linked to sites with limited light and a large amount of canopy cover. Tank and Dodds (2003) also presented a literature review that closely mirrored that of Francoeur (2001) in the percent responses to N and N 1 P treatments.

Few nutrient-releasing substrata experiments have tested for nutrient responses other than N and P. Chessman et al. (1992) tested for trace nutrient concentrations in eight streams during two seasons in Australia. They found no evidence for trace nutrients (Ca, Mg, K, S, Fe, Mn, Co Cu, Zn, thiamine, biotin, or B_{12}) stimulating algal growth in any stream during any season. The most common response was to N addition alone, with secondary P limitation occurring frequently.

Whole-stream fertilization experiments are rarely conducted under natural conditions, but Stockner and Shortreed (1978) used streamside enrichment troughs in British Columbia and demonstrated a strong P enrichment effect on algal biomass, with a secondary N enrichment effect. Enrichment of the Nechako River in British Columbia indicated N limitation (Perrin and Richardson 1997). Enrichment of a tundra river with P for four consecutive summers ®rst stimulated algal biomass and productivity and eventually stimulated ®sh production (Peterson et al. 1993).

An alternative, empirical approach for determining the response of algal biomass to nutrients is to establish the statistical relationship between in-stream nutrients and algal biomass. This approach was applied across Missouri streams of varied nutrient enrichment, and positive relationships between water column total N and benthic chlorophyll were found, with a similar relationship between total P and mean benthic chlorophyll (Lohman et al. 1992). Nutrient-enriched sites in this study had more rapid chlorophyll accrual after a scouring ¯ood than nutrient-poor sites. Lohman et al. (1992) speculated that N was more important in these

Table 1. Some studies of ¯owing waters reporting nitrogen and phosphorus enhancement of heterotrophic activities.

Location	Response variables	Response	Reference
Shaded New Zealand stream	^{14}C glucose incorporation, endocellulase activity	N and P stimulated endocellulase activity, but not glucose uptake	Tank and Winterbourn 1996
Small Appalachian streams	Microbial respiration, fungal biomass, extracellular enzyme activity	N and P colimitation	Tank and Webster 1998
Laboratory with stream assemblages	Leaf degradation by bacteria and fungi	N and P stimulated degradation	Gulis and Suberkropp 2002
10 North American streams	Fungal biomass (ergosterol)	2 streams, no effect; 2, P effect; 4, N stimulation; 2, P stimulation	Tank and Dodds 2003
Laboratory experiment	Leaf mass loss	Both N and P effects found	Bärlocher and Corkum 2003
Coastal wetland soil	Bacterial activity	P stimulated bacteria, whereas N stimulated macrophytes	Sundareshwar et al. 2003
Laboratory experiments on plankton from blackwater streams of North Carolina	Bacterial counts	Both N and P stimulated bacteria	Mallin et al. 2004
Carolina streams	Fungal biomass (ergosterol)	High N- and P-sites had greater ergosterol accumulation	Padgett et al. 2000

streams than P. Similar relationships were subsequently established for 13 rivers in southern Ontario (Châtelat et al. 1999).

A cross-system analysis of temperate streams established that total N and total P in the water column were signi®cantly related to benthic algal biomass (Dodds et al. 1997). This relationship is relevant to trophic state because production is positively correlated with algal biomass (Fig. 1). Subsequent analysis of an expanded data set suggested that mean and maximum algal biomass were signi®cantly correlated with total N and, to a lesser extent, with total P in the water column and that the best predictive model for algal biomass included both N and P. This analysis also suggested that in excess of a threshold value of total N and total P, there are no increases in mean benthic chlorophyll, thus indicating that nutrient limitation is overcome when water column nutrient concentrations are great enough (Dodds et al. 2002).

Positive correlations also exist between planktonic chlorophyll and water column nutrients in lotic systems. An analysis of suspended chlorophyll in temperate rivers and streams showed a positive relationship between water column total P and suspended chlorophyll (Van Nieuwenhuyse and Jones 1996), with an apparent decrease in planktonic chlorophyll yield per unit P when total P was in excess of approximately 300 mg m^{23}. These authors did not consider total N, so the relative importance of N and P could not be assessed from their data. However, Basu and Pick (1996) studied 31 Canadian Shield rivers and found positive correlations of sestonic chlorophyll with total N in addition to total P, but did not demonstrate any decrease in chlorophyll yield at high nutrient concentrations.

Nutrient enrichment experiments on heterotrophic activity are less numerous. However, the existing laboratory and ®eld experiments suggest that nutrients can limit heterotrophic activity (N, P, or both can be important, Table 1). A survey of stream metabolism across eight streams from various North American biomes indicated that soluble reactive P concentrations were positively correlated with both GPP and respiration (Mulholland et al. 2001).

The forms that N and P are in might not be extremely important determinants of heterotrophic or autotrophic state. Algae can use organic N as a primary N source (Antia et al. 1991). In addition, heterotrophic bacteria can be strong competitors for dissolved inorganic nutrients as well as nutrients in dissolved organic compounds (Dodds 2002).

Both N and P (in organic and inorganic forms) could be important determinants of autotrophic and heterotrophic activity in rivers and streams. This is borne out by manipulative experimental approaches and empirical analyses. There is little experimental support for minor nutrients stimulating heterotrophic or autotrophic microbial activity. As discussed in the introductory section, it is clear that C additions will have a strong in¯uence on system heterotrophic activity (O_2 consumption). It is probably unwise to assume a priori that P is the limiting nutrient of the autotrophic state in any particular stream.

Determining boundaries of trophic state

Data presented in the previous section suggest that water column N and P should be considered when characterizing the autotrophic state of rivers and streams and perhaps when determining heterotrophic state. The relative trophic state should be based on the frequency distribution of relatively pristine lotic waters because anthropogenic inputs change over time, as will trophic boundaries. Whereas Dodds et al. (1998) considered total N, total P, and benthic chlorophyll across a wide variety of streams, they did not account for streams that are naturally heterotrophic and did not attempt to use only reference streams to create an expected distribution in the absence of anthropogenic effects.

Reference nutrient data can be used to establish rough limits on the autotrophic state of streams with regard to nutrients; I present one possible approach. Reference nutrient

Table 2. Lower one-third and upper one-third of the distribution of stream total N and total P pooled across 14 ecoregions according to reference values determined for each individual ecoregion by Smith et al. (2003), 13 ecoregions for total P, and 12 ecoregions for total N from Dodds and Oakes (2004) and the relationship of the boundary numbers from Smith et al. (2003) data to cumulative frequency distribution of benthic chlorophyll (Chl) as a function of total N or total P (Fig. 1) expressed as the percentage of benthic chlorophyll mean or maximum values exceeding 100 mg m^{22} when nutrient values were less than the boundary value. For example, when seasonal mean of total N was , 714 mg m^{23}, then 10% of the streams had mean benthic chlorophyll values exceeding 100 mg m^{22} and 29% had maximum values exceeding that amount.

		Concentration (mg m^{23})		Cases exceeding 100 mg m^{22} (%)	
Nutrient	Autotrophic state boundary	Smith et al. 2003	Dodds and Oakes 2004	Mean Chl	Maximum Chl
Total N	Lower one-third	285	370	7	27
	Upper one-third	714	659	10	29
Total P	Lower one-third	29	23	5	17
	Upper one-third	71	48	13	25

concentrations from modeling, including a correction for atmospheric N deposition, have been proposed for 14 nutrient ecoregions across the United States (Smith et al. 2003). I ranked the median values (one for each ecoregion), and the distribution was divided into the lower, middle, and upper one third (oligotrophic, mesotrophic, and eutrophic, respectively, following limnological convention) of the reference nutrient values (Table 2). The distribution of reference nutrient values roughly agreed with those provided by Dodds and Oakes (2004), who corrected for anthropogenic in¯uences (as represented by human population density and land use characteristics) on stream nutrient concentrations with analysis of covariance across the same ecoregions (Table 2).

There is a positive correlation between autotrophic activity and benthic chlorophyll concentrations in rivers and streams (Fig. 1). Therefore, I initially base autotrophic boundaries on standing stocks of algal biomass, as is the convention in lakes. To accomplish this, the reference nutrient values from Smith et al. 2003 are applied to observed frequency distributions of seasonal mean and maximum benthic chlorophyll, plotted against water column nutrients (Fig. 2). These frequency distributions are used to calculate the probability that a stream will have a given amount of chlorophyll at a speci®c level of nutrients (Table 2). Relationships derived from those developed by Dodds et al. (2002, corrected for errors Dodds made when entering data from Lohman) also can be used to calculate expected mean and maximum values for benthic chlorophyll on the basis of the nutrient boundaries presented in Table 2 (Table 3).

Benthic chlorophyll values . 100 mg m^{22} previously have been considered a nuisance (Welch et al. 1988). This analysis suggests that a mean value of 100 mg m^{22} of chlorophyll is attained in , 7% of oligotrophic streams and in 10±13% of eutrophic systems. The regression analyses also suggest that oligotrophic systems should exhibit maximum benthic chlorophyll values . 100 mg m^{22} only 27% of the time. Other approaches are possible (e.g., Dodds et al. 1998), but the method presented in this paper considers the dynamic nature of chlorophyll in streams and is reference based.

A similar approach to determining reference trophic state can be taken with regard to planktonic chlorophyll in rivers and streams. A large data set (n 5 292) of lotic planktonic chlorophyll and water column total P was assembled for temperate rivers and streams, and associated regression equations can be used to link nutrients and phytoplankton biomass (Van Nieuwenhuyse and Jones 1996). A smaller data set from 31 rivers in southern Ontario and western Quebec related total N (mg m^{23}) and total P to planktonic chlorophyll (mg m^{23}; Basu and Pick 1996). This paper presented a regression equation for total P, but regression of their raw data yielded the following relationship.

$$\log_{10}(\text{planktonic chlorophyll}) \quad 5 \quad 2 1.247 \quad 1 \quad 0.676 \log_{10}(\text{total N}) \qquad r^2 \quad 5 \quad 0.65$$

The distribution of reference values from Smith et al. (2003) can then be used to calculate autotrophic categories from these equations (Table 4). These data agree roughly with both the Van Nieuwenhuyse and Jones (1996) and the Basu and Pick (1996) equations for total P, but the total N boundaries derived from the Basu and Pick chlorophyll±total N relationship were substantially lower than those derived for total P from the same data set. The data suggest that planktonic chlorophyll only exceeds values considered typical of eutrophic lakes (8 mg m^{23}; Dodds 2002) when nutrients are abundant relative to the reference condition. The data also are consistent with the idea that the amount of planktonic chlorophyll per unit total N or total P is less in lotic waters than in lentic waters (Sùballe and Kimmel 1987).

More limited data are available for whole-stream estimates of autotrophic and heterotrophic state, but some idea of the ranges expected for the trophic states can be gleaned from analysis of the results of a cross-system study (Mulholland et al. 2001). Although this study and an additional data point (P. Mulholland pers. comm.) only covers nine streams, it has three important characteristics. First, all the measurements were done the same way at each site with methods likely to give the best results (two-station diel O_2 method, corrected for groundwater in¯uences). Second, all the sites studied but one were relatively pristine small streams, so the data can be used to determine trophic boundaries mostly in the absence of human effects. Third, the streams were located in a variety of biomes, including one desert, one prairie, one tropical, one arid montane, one mesic montane, and four temperate deciduous biomes (Mulholland et al. 2001). Whole-stream autotrophic state varied over 150-fold in this data set (very high rates of GPP were associated with the lighted desert stream), with the central one third of the distribution falling between 0.4 and 1.8 g O_2 m^{22} d^{21} (Table 5). Heterotrophic state was considerably less variable, ranging about 10-fold with the central one third of the distribution falling between 6.7 and 8.3 g O_2 m^{22} d^{21} (Table 5).

Bott et al. (1985) reviewed studies of ; 70 streams with

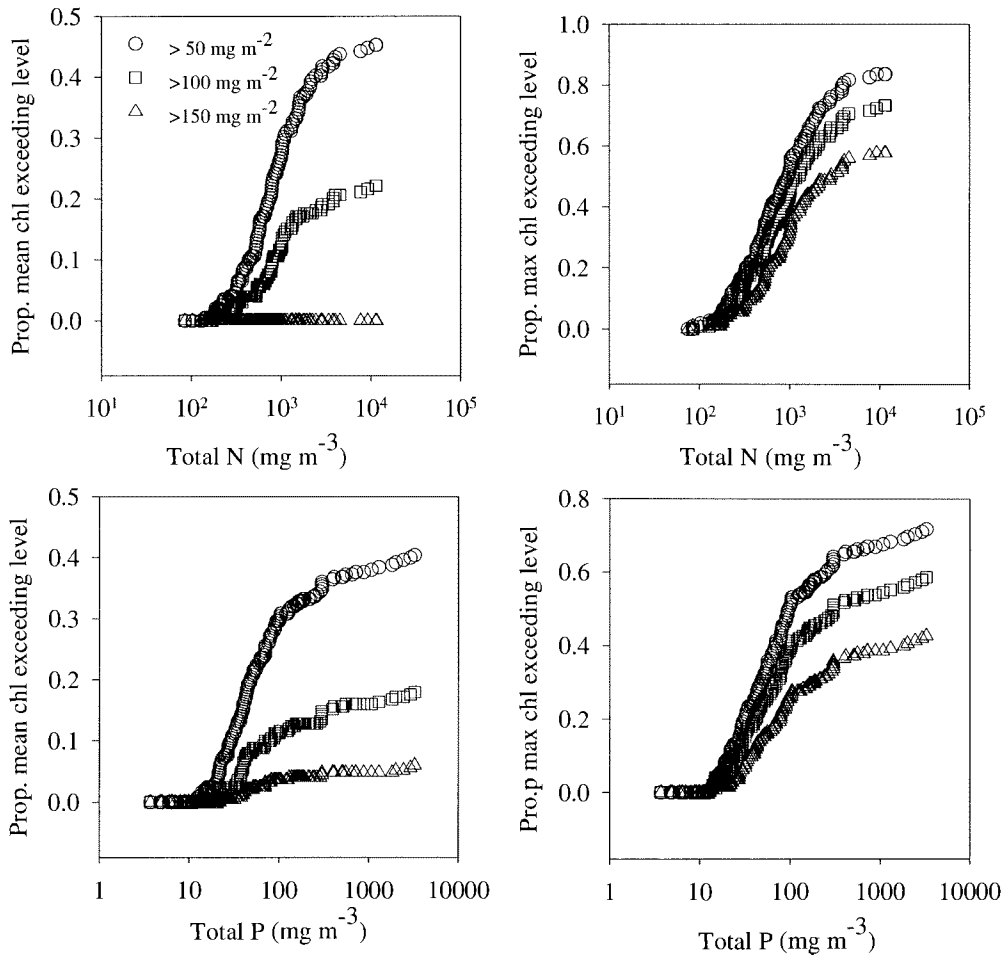

Fig. 2. Relationships between seasonal mean water column nutrients (total N and total P) and proportion of instances in which seasonal mean and maximum chlorophyll exceed 50, 100, or 150 mg m^{23}. Data are from literature sources compiled in Dodds et al. (2002), mostly for shallow rivers and streams. This compilation previously had incorrect values for data reported by Lohman et al. (1992). Those values now match the original source. *n* 5 250 for total P and *n* 5 199 for total N.

maximum rates of 48 and 50 g O_2 m^{22} d^{21} for GPP and respiration, respectively. These rates were from streams with human effects and were several-fold higher than the maximum from more pristine streams. This indicates that both autotrophic state and heterotrophic state can be in¯uenced by eutrophication. Maximum rates of GPP are probably limited by light under nutrient-replete conditions, whereas respiration is probably limited by O_2 aeration rate in streams with high loading of biochemical oxygen demand.

I speculate that light limits autotrophic state of streams (interception by the canopy), but not heterotrophic state, because although light is intercepted by riparian vegetation, it

Table 3. Corrected regression equations for data presented in Dodds et al. (2002) and expected autotrophic state mean and maximum benthic chlorophyll (Chl) values calculated from nutrient concentrations in Table 1 with these equations. Equations are of the form $\log_{10}$(mg chlorophyll m^{22}) 5 Intercept 1 B1 $\log_{10}$(mg m^{23} total N or total P) 1 B2 [$\log_{10}$(mg m^{23} total N or total P)]^2.

Relationship	Intercept	B_1	B_2	R^2	Expected chlorophyll (mg m^2) Lower Ä	Upper Ä
Mean Chl versus total N	22.638	2.460	20.320	0.401	30	60
Maximum Chl versus total N	0.438	0.613		0.295	88	154
Mean Chl versus total P	20.608	1.486	20.255	0.402	36	65
Maximum Chl versus total P	0.216	1.680	20.297	0.371	109	204

Table 4. Autotrophic state boundaries for suspended chlorophyll in temperate rivers and streams as calculated from the reference nutrient concentrations from Smith et al. (2003) and regression equations based on Van Nieuwenhuyse and Jones (1996) and Basu and Pick (1996).

Nutrient	Autotrophic state boundary	Nutrient conc. (mg m^{-3})	Planktonic chlorophyll (mg m^{-3}) Van Nieuwenhuyse and Jones (1996)	Basu and Pick (1996)
Total N	Lower one-third	285		2.4
	Upper one-third	714		4.5
Total P	Lower one-third	29	4.6	6.4
	Upper one-third	71	11.9	12.3

Table 5. Distribution of whole-stream metabolism rates from nine small, relatively pristine streams (data from Mullholland et al. [2001] plus one point from Ball Creek, North Carolina [Mulholland pers. comm.]). Respiration rates are corrected for groundwater input.

Distribution	Metabolism (g O_2 m^{-2} d^{-1}) Gross primary production	Respiration	Net primary production
Upper one-third	1.8	8.3	−4.2
Lower one-third	0.4	6.7	−6.7
Minimum	0.06	2.4	−29
Maximum	15	29	6.7

does not substantially influence rates of C input. I predict that the amount of C fixed by the riparian canopy that enters the streams to fuel heterotrophic activity is approximately equal to what would enter by autochthonous production in a lighted stream without canopy cover.

Small streams in forested biomes are shaded, have substantial amounts of organic C input from nearby riparian areas fueling heterotrophic activity, and have minimal autotrophic production (except in deciduous seasonal forests in which light can penetrate the canopy when leaves are not present). Prairie, tundra, or desert streams have limited riparian canopy and substantial autotrophic production fueling heterotrophic activity. An independent measure of total metabolic activity, N uptake rates, also varied little across the range of biomes studied by Mulholland et al. (2001), supporting the concept of relatively constant heterotrophic activity in small pristine streams (Webster et al. 2003). Heterotrophic state might be more variable in rivers; canopy has less of an influence, and turbidity could substantially interfere with riverine C production.

Although the approach taken here might provide useful in setting boundaries for autotrophic and heterotrophic state, more comprehensive measurements of stream metabolism are required. Until such comprehensive measurements are made, the values for boundaries presented here should be used with caution. In addition, whole-river metabolism rates are difficult to measure, and data are difficult to come by for such rivers. Very few large rivers remain in temperate regions that are relatively weakly influenced by humans, so it might not be possible to set definitive autotrophic and heterotrophic state boundaries for larger lotic systems in some regions.

Although determining trophic boundaries could be useful in describing fundamental ecosystem processes, changes in trophic state must be linked to other aspects of stream ecosystems for such boundaries to be relevant. Furthermore, it is important to explore how stream eutrophication is propagated through the food web to influence biotic integrity and community structure.

Effects of eutrophication

Producers—Stevenson and Pan (1999) reviewed the uses of diatoms for assessing environmental conditions in rivers and streams. They traced the use of species compositions of algae to infer amount of pollution to work by Kolkwitz and Marsson in the early 1900s, with substantial contributions by Ruth Patrick in the 1940s and 1950s (as cited by Stevenson and Pan 1999). Studies that use algal assemblages as indicators of the extent of pollution rely on the concept that predictable species shifts occur with set amounts of enrichment (e.g., Kelly 2002). Detailed work has been carried out relating nutrients to diatom and other algal assemblages in several places, mostly in temperate, developed countries.

The green alga *Cladophora* has often been associated with eutrophication events (Hynes 1960) and is ubiquitous in nutrient-rich flowing waters (Dodds and Gudder 1992). Large streamers of *Cladophora* develop under nutrient-rich conditions. These streamers potentially lead to low O_2 events at night, alter the community structure, snag fish lures, slow water flow in canals, and clog industrial and domestic water intakes (Dodds and Gudder 1992).

One of the problems with predicting eutrophication effects in streams is that variability caused by flooding can influence autotrophic state. At one extreme, algal biomass might not accrue with ample light and nutrients if floods always scour biomass. On the other end of the spectrum, attached algae might be able to attain impressive biomass in nutrient-poor water because periphyton can use the small amounts of nutrients that continuously flow by. Biggs (2000) developed a comprehensive model linking hydrologic regime and nutrients to accrual of algal biomass. This model was developed with a database from New Zealand rivers and streams across a wide range of land use practices and hydrologic patterns. Regressions considering only dissolved inorganic nutrients could predict algal biomass with r^2 values of approximately 30%. Consideration of the time of accrual (time since the last scouring flood) increased r^2 values to about 70%. The work of Biggs (2000) supports the proposition that eutrophication effects will be stronger under stable flow regimes.

The effects of eutrophication on macrophytes in flowing waters have been poorly studied, and the effects of nutrient reductions on macrophyte biomass are difficult to predict (Chambers et al. 1999). Biomass of macrophytes declined in the Bow River (Alberta) in response to nutrient control (particularly N) from municipal wastewater sources (Sosiak 2002). Sewage effluent led to substantially greater macrophyte biomass in the Saskatchewan River (Saskatchewan),

and this was correlated with somewhat decreased dissolved O_2 concentration (Chambers and Prepas 1994).

In some rivers and streams with reduced water replacement times, phytoplankton blooms can become problematic, with cyanobacterial blooms more likely in excess-nutrient conditions (Smith 2003). Shorter water turnover time (hydraulic residence time) leads to a decreased amount of suspended chlorophyll per unit concentration of P (Sùballe and Kimmel 1987). Problems occur with phytoplankton blooms in European and other rivers around the world (Wehr and Descy 1998). In the Murray Darling river system in South Australia, water withdrawals reduce ¯ow to a near standstill in the river, and excess amounts of nutrients, strati®cation, and warm temperature stimulate algal blooms (Maier et al. 2001). These blooms are commonly dominated by the hepatotoxic *Microcystis*. Other slow-¯owing rivers in the world suffer a similar fate, particularly those with limited quantities of light-intercepting ®ne sediments.

Microbial heterotrophs Ð Although enrichment experiments have documented that rates of microbial heterotrophic processing of organic materials can be stimulated by nutrients (as previously discussed), less is known about in¯uences on the heterotrophic microbial community. If the primary source of organic C to a stream or river is leaf material, N and P need to be obtained from the water column, and nutrient enrichment will increase C utilization rates. One study documented that nutrient enrichment causes shifts in fungal taxa associated with decomposing leaf litter (Gulis and Suberkropp 2002). Presumably, some bacteria that decompose organic matter are better competitors for organic nutrients than others, leading to shifts in community structure in response to nutrient enrichment. Future studies are likely to document this effect, given the recent expansion of molecular techniques. Clear increases in the rates of heterotrophic microbial biogeochemical cycling (denitri®cation) related to nutrient enrichment by agricultural practices have been demonstrated (Kemp and Dodds 2002).

Food web effects Ð Effects of C and, particularly, N and P loading on animals in streams are less clear. The effects of C on the animal community are obvious, with greater rates of organic C loading leading to dominance by pollution-tolerant invertebrates (such as *Tubifex, Limnodrilus, Chironomus*), decreases in diversity, and increases in raw abundance (Hynes 1960). With the advent of BOD treatment in sewage and industrial ef¯uents in developed nations, less attention has been paid to the effects of BOD loading.

Enrichment effects related to N and P are less well established. Macroinvertebrate assemblage structure has been correlated statistically with P concentration (Miltner and Rankin 1998). Nutrient enrichment can cause increases in invertebrate abundance and alters assemblage structure (Bourassa and Cattaneo 1998). The clearest study to date on the importance of sustained nutrient loading to the food web occurred on the Lawrence River downstream of Montreal, Quebec. This study used the distinctive isotopic signal of ^{15}N to establish that nutrients from the sewage outfall signi®cantly enriched macroinvertebrates and production of both macroinvertebrates and ®shes (deBruyn et al. 2003). The sewage was treated for BOD, but stimulated secondary production over ®vefold in spite of the small amount of N and P that entered the food web in the sewage plume 10 km down from the sewage outfall.

Control of cultural eutrophication Ð Given the de®nition of the trophic state proposed, and the potential effects of autotrophic and heterotrophic eutrophication, what considerations are important in controlling eutrophication? Mechanistic methods are only beginning to be established for linking in-stream nutrient concentrations to watershed activities. Empirical methods have prevailed (e.g., Dodds et al. 1997) until recently. Modeling efforts are beginning to re®ne nutrient concentration and loading estimates for rivers, but there still is some dif®culty in linking models created for small streams with larger river systems (e.g., Alexander et al. 2002). Ultimately, linking land use practices, including both point and nonpoint sources of nutrients, to instream nutrient concentrations will be necessary to control cultural eutrophication that in¯uences autotrophic state, and potentially in¯uences heterotrophic state.

Nutrient control is, on one level, simple. Agricultural practices, atmospheric loading, and human sewage outfall increase inorganic and organic nutrients in rivers and streams. Technology is available to decrease that input (but nonpoint sources of nutrients such as atmospheric deposition and runoff from cropland remain dif®cult to control). Best management practices of cropland include riparian buffer strips, cropland terracing, and the use of only the necessary amounts of fertilizer. Ef¯uent from human sewage and livestock-handling facilities can be treated with existing tertiary treatment methods (e.g., denitri®cation facilities, P precipitation) to reduce N and P loads to lotic waters. The effective reduction of BOD into the waters of most developed countries exempli®es the technical ability of water treatment engineers and managers to remove potentially harmful pollutants at acceptable costs. The challenge now is to determine what lengths are necessary to control point and nonpoint source pollution, and to what degree the bene®ts of nutrient control justify the costs. Determining the reference trophic state provides a starting point for cost±bene®t and feasibility analyses of eutrophication control schemes.

Nutrient cycles do not occur in isolation, and colimitation of algal and heterotrophic activity is commonly seen in bioassays (Tank and Dodds 2003). We are only beginning to understand the implications of the effects of humans on the stoichiometry of nutrient loading (Turner 2002). Stoichiometric changes could alter algal assemblages and relative rates of material ¯ux (e.g., Woodruff et al. 1999). Changes in stoichiometry could then cascade to higher trophic levels (Frost et al. 2002).

Given the broad de®nition of eutrophication presented herein, organic C enrichment should be considered, as well as anthropogenic processes causing shifts in the relative heterotrophic and autotrophic states. For example, increased BOD from sewage has de®nite in¯uences on stream heterotrophic state. In addition, shifts in riparian vegetation, such as loss of riparian forests, might increase the autotrophic state and decrease the heterotrophic state. In systems such as tallgrass prairies, historically dominated by little riparian

vegetation, increases in riparian vegetation could alter the fundamental ecosystem and community structure (Dodds et al. 2004). Finally, organic C enrichment might interact with N and P enrichment. The highest rates of C consumption and the greatest biomass of heterotrophic organisms are expected when loading of N, P, and C are simultaneously high.

Water retention times might alter nutrient stoichiometry and heterotrophic and autotrophic states by in¯uencing deposition and nutrient processing rates. Small and large impoundments that were not historically present are now a ubiquitous feature on many river networks. Such impoundments could also alter the balance between heterotrophic and autotrophic states because many recalcitrant C-rich particulate organic materials can settle in the reservoir, and plankton with relatively low values of C:N and C:P could dominate reservoir tail waters (Whiles and Dodds 2002).

Humans will affect ever more river miles with hydrologic modi®cation, alter the inputs of organic C and its form to lotic waters through alteration of riparian vegetation and input of BOD in sewage from humans and livestock. Increased fertilizer to grow the crops necessary to feed an expanding human population and increases in industrial livestock operations resulting in vast production of animal waste will cause further eutrophication of already affected rivers and streams. These effects will continue to spread into the few relatively pristine watersheds that remain on earth, altering water quality and in¯uencing the biotic integrity of these waters. Understanding the full implications of these effects will require further knowledge of the native trophic state of streams as a baseline. More complete comprehension of how nutrient interactions in¯uence trophic state, and determination of trophic states of medium to large rivers will improve the scienti®c basis for managing eutrophication of lotic waters.

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Received: 26 July 2004
Accepted: 4 November 2004
Amended: 19 November 2004

EPA-SAB-17-xxx

The Honorable E. Scott Pruitt
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Subject: SAB Review of Lake Erie Nutrient Load Reduction Models and Targets

Dear Administrator Pruitt:

The enclosed report provides the SAB's consensus advice and recommendations on the development of nutrient-load reduction targets for Lake Erie. At the EPA's request, the SAB has reviewed the modeling approach and results used to develop nutrient-load reduction targets for Lake Erie and provides advice on an adaptive management approach to implementing nutrient reduction goals.

EPA Region 5 is co-leading a binational workgroup established under the Great Lakes Water Quality Agreement to develop phosphorus load-reduction targets, strategies and action plans for Lake Erie. In December 2014, the EPA received early advice from the SAB on a modeling approach to develop the phosphorus-reduction targets. A binational workgroup of scientists (Modeling Subgroup) then used a suite of models to generate a series of load-response curves to simulate the impact of phosphorus loads on eutrophication indicators in Lake Erie. The load-response curves were used by the Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team (Task Team) to identify phosphorus reductions needed to meet indicator thresholds associated with desired ecological conditions. Two documents were submitted to the SAB for review: (1) a report titled *Annex 4 Ensemble Modeling Report (May 2016 Peer Review Draft) and* (2) a report titled *Recommended Phosphorus Loading Targets for Lake Erie, Annex 4 Objectives and Targets Task Team Final Report to the Nutrients Annex Subcommittee (May 11, 2015).*

The SAB was asked to respond to six charge questions that focused on: (1) the adequacy of the evaluation of the models used to develop load-response curves; (2) whether the recommended phosphorus load-reduction targets are based on the best available information; (3) whether scientifically sound phosphorus load reductions can be developed to address growth of a nuisance alga, *Cladophora*; (4) whether nitrogen control, in addition to phosphorus, is warranted in Lake Erie; (5) recommended approaches to assess progress in reducing loadings of phosphorus; and (6) recommendations for an adaptive management approach to implement nutrient reduction goals for Lake Erie.

The SAB commends the EPA for its efforts to determine whether the models used to simulate and evaluate the impact of phosphorus loads to Lake Erie meet standards that provide confidence in the accuracy and reliability of results. The models used for the simulations are limited by the data available for calibration and validation, and this affects the ability to rigorously evaluate model quality. The Modeling Subgroup applied and evaluated the suite of models independently, rather than as part of an ensemble approach; some models were accepted for use despite deficiencies relative to model evaluation criteria. The SAB's major comments and recommendations are as follows:

- The models evaluated and used by the Modeling Subgroup are not of equal reliability. Assessment of the response to phosphorus loads could be improved by giving greater weight to the load-response curves generated by the models deemed most reliable. Given the limitations of some of the models evaluated, and the practical limits of funding, the number of models considered should be reduced. It might prove most efficient to choose a single model and to further develop that model using the insights and demonstrated capabilities provided by the other models and the results of ongoing process research and monitoring. Consideration should be given to making Western Lake Erie Ecosystem Model the consensus model for this purpose, with a goal of extending this model to all of Lake Erie.

- The SAB finds that the 40% reduction in total phosphorus load to the Western and Central Basins of Lake Erie recommended by the Task Team will improve Lake Erie water quality and reduce harmful algal blooms. However, even with this reduction, blooms may still occur with some frequency, perhaps even routinely, in Maumee Bay in the Western Basin of Lake Erie. Ultimately, greater load reductions may be necessary to achieve the desired thresholds in the eutrophication-response indicators. Uncertainties in predictions of hypoxia are considerably larger than uncertainties associated with predictions of algal blooms. Continued lake and tributary monitoring and research will be needed to support adaptive management and the models used to simulate load reductions.

- Scientifically sound phosphorus load reduction recommendations to reduce *Cladophora* growth in the Eastern Basin of Lake Erie cannot be developed at this time. The SAB finds that there is insufficient information available to understand and weigh the relative importance of environmental factors that might have causal links to *Cladophora* growth. The Great Lakes *Cladophora* Model can be used to evaluate *Cladophora* occurrence and provide initial predictions of *Cladophora* biomass. However, knowledge gaps must be filled before phosphorus load-reduction recommendations to reduce *Cladophora* growth can be developed with an adequate level of certainty and scientific confidence.

- While phosphorus has always been considered the limiting nutrient for Lake Erie and most other lakes, there is increasing evidence of the possible need for nitrogen control as well. In order to evaluate the importance of nitrogen control in Lake Erie, research should be conducted to answer a number of key questions and understand important relationships. These issues are identified and discussed in the enclosed report.

- Tracking flow-weighted mean concentrations of phosphorus in Lake Erie tributaries, as recommended by the Task Team, is a useful approach for measuring progress in load reduction. This approach accounts for variability in hydrology. However, the SAB recommends that all available monitoring data (discharge, flow, concentrations and loads) from significant tributaries and multiple assessment approaches be reviewed and used to evaluate efforts to reduce nutrient loadings. The SAB also recommends that the uncertainty in values derived using flow-weighted or flow-adjusted assessment approaches be explicitly quantified and presented, and that detailed information on the implementation of phosphorus reduction strategies be collected to help identify the reasons for observed changes in phosphorus loads delivered to Lake Erie.

- The SAB strongly endorses development of an adaptive management program to implement and evaluate nutrient reduction goals for Lake Erie and recommends that the EPA formally appoint a standing committee to develop and coordinate the program. The adaptive management program should include long-term monitoring and application of process-based eutrophication models to make annual predictions of eutrophication response indicators. The program should assess empirical data against model results and test alternative hypotheses and conceptual models to help explain discrepancies and use new knowledge to adjust management operations. The results of these assessments and hypothesis and model testing will also guide future monitoring and modeling efforts. In the enclosed report the SAB suggests a number of important research, monitoring, and modeling tasks to provide information needed for nutrient-load reduction and management of harmful algal blooms and hypoxia.

The SAB appreciates the opportunity to provide the EPA with advice on this important subject. We look forward to receiving the agency's response.

Sincerely,

Enclosure

NOTICE

This report has been written as part of the activities of the EPA Science Advisory Board (SAB), a public advisory group providing extramural scientific information and advice to the Administrator and other officials of the Environmental Protection Agency. The SAB is structured to provide balanced, expert assessment of scientific matters related to problems facing the Agency. This report has not been reviewed for approval by the Agency and, hence, the contents of this report do not necessarily represent the views and policies of the Environmental Protection Agency, nor of other agencies in the Executive Branch of the Federal government, nor does mention of trade names of commercial products constitute a recommendation for use. Reports of the SAB are posted on the EPA Web site at http://www.epa.gov/sab.

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APPENDIX A: THE EPA'S CHARGE QUESTIONS **A-1**

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Acronyms and Abbreviations

NH_4^+	Ammonium
ANAMMOX	Anaerobic Ammonium Oxidation
BMP	Best Management Practice
CAEDYM	Computational Aquatic Ecosystem Dynamics Model
cm	Centimeter
DIN	Dissolved Inorganic Nitrogen
DOC	Dissolved Organic Carbon
DOP	Dissolved Organic Phosphorus
DNRA	Dissimilatory Nitrate Reduction to Ammonium
EcoLE	Ecological Model of Lake Erie
ELCOM	Estuary, Lake and Coastal Ocean Model
ELCM	Estuary and Lake Computer Model
ERI	Eutrophication Response Indicator
FAC	Flow Adjusted Concentration
FWMC	Flow Weighted Mean Concentration
GLCM	Great Lakes *Cladophora* Model
GLWQA	Great Lakes Water Quality Agreement
HAB	Harmful Algal Bloom
MT	Metric Ton
m	meter
µg	Microgram
mg/L	Milligrams Per Liter
N	Nitrogen
NO_2^-	Nitrite
NO_3^-	Nitrate
P	Phosphorus
POC	Particulate Organic Carbon
ppb	Parts Per Billion
P-Quota	Cellular Phosphorus Concentration
SOD	Sediment Oxygen Demand
SRP	Soluble Reactive Phosphorus
TKN	Total Kjeldahl Nitrogen
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
USDA	U.S. Department of Agriculture
WLEEM	Western Lake Erie Ecosystem Model
WHO	World Health Organization

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1. EXECUTIVE SUMMARY

EPA Region 5 is co-leading a binational workgroup to develop and implement the Nutrients Annex ("Annex 4") of the 2012 Great Lakes Water Quality Agreement (GLWQA). Under Annex 4 the U.S. and Canada committed to address eutrophication issues in Lake Erie by first establishing phosphorus (P) objectives, loading targets and allocations for nearshore and offshore waters and subsequently developing P-reduction strategies and domestic action plans. In December 2014, the EPA received early advice from the SAB on a modeling approach to develop P-reduction targets. A binational workgroup of scientists (The Annex 4 Objectives and Targets Task Team Modeling Subgroup) then used a suite of models to generate a series of load-response curves to simulate the impact of P loads on cyanobacteria biomass, hypoxia and nuisance *Cladophora* growth. These load-response curves were used by the Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team (Task Team) to identify P load reductions needed to produce desired ecological conditions for Lake Erie.

The EPA requested that the SAB review the modeling approach and results used to develop the P load reduction targets for Lake Erie. The SAB was also asked to provide advice on how to periodically evaluate the nutrient reduction targets. The EPA submitted two documents to the SAB for review: (1) a report titled *Annex 4 Ensemble Modeling Report (May 2016 Peer Review Draft)* and (2) a report titled *Recommended Phosphorus Loading Targets for Lake Erie, Annex 4 Objectives and Targets Task Team Final Report to the Nutrients Annex Subcommittee (May 11, 2015)*. The SAB was asked to respond to six charge questions that focused on: (1) the adequacy of the evaluation of the models used to develop load-response curves; (2) whether the recommended P load reduction targets are based on the best available information on drivers of cyanobacteria growth and seasonal hypoxia in Lake Erie; (3) whether scientifically-sound P load reductions can be developed to address the problem of *Cladophora* growth in Lake Erie; (4) whether nitrogen (N) control, in addition to P, is warranted in Lake Erie to prevent harmful algal blooms and manage hypoxia; (5) how to account for inter-annual variability in hydrology when assessing progress in reducing loadings of P to Lake Erie; and (6) recommendations for an adaptive management approach to implement nutrient reduction goals for Lake Erie. This executive summary highlights the findings and recommendations of the SAB in response to the charge questions provided in Appendix A.

Evaluation of the Models to Inform Interpretation of Results

The SAB was asked to comment on: (1) whether the evaluation of the models was adequate to inform how model results should be interpreted, and (2) any additional analyses that may be needed to improve future development and interpretation of the load-response curves for the eutrophication response indicators. The Modeling Subgroup applied and evaluated the suite of models independently, rather than as part of an ensemble approach; some models were accepted for use despite deficiencies relative to model evaluation criteria. The SAB recognizes that the models are limited by the data available for calibration and validation and this affects the ability to rigorously evaluate model quality. A better understanding of the limitations of the data and the data requirements needed to produce higher certainty in estimates should be sought. The model evaluations did not attempt to characterize the relative strengths of each model or the consistency of descriptions of underlying key processes. Furthermore, all of the load-response curves were treated as equally likely, despite differences in estimated load and model uncertainty. The SAB finds that the models are not of equal reliability, and the assessment of load-responses would have benefited by giving greater weight to response curves generated by the

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models that appear to be most reliable on the basis of the model evaluation. Although the model evaluation included efforts to characterize uncertainty, the approaches used to quantify uncertainty differed among the models. Therefore, assessed uncertainties cannot be compared across models and uncertainties were not used to evaluate the likelihood that loading targets would achieve desired threshold values of the selected ecosystem response.

The number of models considered for use should be reduced. Priority should be given to the process-based models that have the capability to account for the response to load reductions, climate changes and relevant ecological processes such as the internal storage and recycling of nutrients. Given practical limits of funding and the limitations of some of the models evaluated, consideration should be given to further developing one process-based model using the insights and demonstrated capabilities provided by the other models; the Western Lake Erie Ecosystem Model (WLEEM) could be the consensus model for this purpose.

The SAB also recommends that synoptic sampling of key variables be conducted on an ongoing basis to support continued model evaluation and refinement for Lake Erie. It is important to monitor flow, nutrient concentration and total suspended solids in the significant tributaries to Lake Erie at sufficient frequencies to make accurate estimates of loading. Estimates of loading could be further improved by linking land-use models with loading models. If multiple models are used to derive load-response information, consideration should be given to combining model estimates using either likelihood based methods or Bayesian model averaging to produce a weighted quantitative characterization of the loading curve and associated uncertainty.

Phosphorus Loading Targets

In order to meet ecosystem objectives[1], the Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team (Task Team) recommended a 40% reduction in the total P load to the Central and Western Basins of Lake Erie. The SAB was asked to comment on whether the recommended loading target reflects the best available information on the key drivers of cyanobacteria growth in the Western Basin, and the potential link with seasonal hypoxia in the Central Basin. Based upon coupling of the suite of models to the relatively long term observational record, the SAB finds a 40% reduction in total P load will improve water quality and reduce the magnitude and extent of harmful algal blooms in keeping with the stated goals in the Task Team report. In addition, the SAB recognizes that the focus of abatement programs should be on reducing those nutrient components that readily support growth of phytoplankton communities. This implies that a focus should be placed on reduction of soluble reactive P (SRP), which is generally regarded as completely bioavailable, as well as those fractions of total P (TP) that may be partially available to phytoplankton (e.g., certain particulate P and dissolved organic P (DOP) fractions. However, even with this reduction, blooms may still occur with some frequency, perhaps even routinely, in Maumee Bay in the Western Basin of Lake Erie. Ultimately, further load reductions may be necessary to achieve the desired thresholds of the eutrophication response indicators. Uncertainties in predictions of hypoxia are considerably larger than uncertainties associated with predictions of algal blooms; the link between algal blooms and hypoxia in the Western Basin is not well understood. A current weakness of the hypoxia evaluation is that multiple year runs of the process

[1] The desired thresholds identified for eutrophication response indicators in Lake Erie were: (1) Western Basin cyanobacteria bloom biomass no less than that observed in 2004 or 2012, nine years out of ten, and/or reduced risk of nearshore localized blooms; and (2) Central Basin hypoxia August – September average hypolimnetic dissolved oxygen concentration of 2.0 mg/L or more (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015).

models have not been conducted. Therefore, the development of a forwarded residual of P or organic matter over time has not been simulated.

As previously indicated, continued lake and tributary monitoring will be needed to support further development of the modeling and adaptive management programs. Additional information (e.g., resuspension fluxes and sediment-water interactions, changes in the response of algal species to P over time, N limitation information) will be needed in order to incorporate currently missing components in the models. These components include: temporal variability in hydrodynamics; factors affecting P uptake by algae; the role of N in mediating algal growth; controls of algal toxin production; internal P loading; the role of dreissenid mussels; seasonality in the timing of nutrient loads; winter-spring diatom blooms under ice; and the effects of climate change.

Development of Recommendations to Address Nuisance Levels of *Cladophora* Growth

The SAB was asked to comment on whether scientifically sound P-load reduction recommendations could be developed to reduce nuisance *Cladophora* growth in the Eastern Basin of Lake Erie. *Cladophora* is a green alga that grows attached to hard benthic substrates. The nuisance attribute of *Cladophora* is that expansive growths of this alga can cover large nearshore regions leading to the formation of "beach muck" and problems that arise from it. The SAB finds that recommendations to reduce the P loadings to control *Cladophora* growth cannot be developed at this time. There is insufficient information available to understand and weigh the relative importance of environmental factors (including P inputs) that might cause *Cladophora* growth and senescence. There are limited observations of the spatial extent of the *Cladophora* problem along the shore of the Eastern Basin of Lake Erie. However, available information does point to a developing basin-wide problem of significant magnitude that warrants immediate action.

The Great Lakes *Cladophora* Model (GLCM) provides a first-order evaluation of *Cladophora* occurrence and initial predictions regarding the reduction of *Cladophora* biomass. However, knowledge gaps must be filled before P-load reduction recommendations to control *Cladophora* growth can be developed with an adequate level of certainty and scientific confidence. These knowledge gaps include the needs to: calibrate the GLCM for use in the Eastern Basin of Lake Erie, understand the importance of P loads from different tributaries and the effect of local hydrodynamics on *Cladophora* growth, understand processes that lead to sloughing of *Cladophora* and its decay to "beach muck," and include the GLCM in a broader whole lake model to forecast the likelihood of *Cladophora* growth. The GLCM would be more useful if it could be further developed to understand the growth of other nuisance benthic algae (e.g., *Chara, Lyngbya, and Spirogyra*) that cause problems similar to those associated with *Cladophora*. It is particularly important to link the data needs of the GLCM with the data collection process. The EPA should evaluate what data are needed to reduce uncertainty in the model and better predict algal growth and presence.

Determination of Whether Nitrogen Control is Warranted

The SAB was asked to provide recommendations to help determine whether consideration of N control, in addition to P, is warranted to reduce eutrophication in Lake Erie. In particular, the SAB was asked to identify questions, relationships, and research priorities related to N loading and cycling that must be addressed. As further discussed in this report, there is increasing evidence that N control, as well as P control, may be needed to reduce eutrophication in Lake Erie. The toxic cyanobacterium, *Microcystis*,

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the major concern in western Lake Erie, does not fix N and therefore requires a fixed N source. *Microcystis* becomes more toxic when nitrate is abundant in lake water, but it can become N-limited in western Lake Erie in late summer. Furthermore, the growth of nuisance benthic algae in the Lake is fueled by loading of both N and P.

In order to evaluate the importance of N control in Lake Erie, future research should answer some key questions and clarify important relationships. Key research questions include: (1) What are the total N loadings entering Lake Erie over time and space (including all of the major species of N)? (2) What is the N budget for Lake Erie? (3) How much external N loading can be removed by internal processes like denitrification, ammonia volatilization and burial, and transformed by dissimilatory nitrate reduction to ammonium (DNRA)?[2] (4) What are the consequences of legacy N and P in the sediments and the differences in internal P and N cycling? (5) What are the downstream consequences of not following a dual nutrient strategy? (6) What is the importance of concentrations and ratios of N to other nutrients in directing or controlling ecosystem functions? (7) What is the ratio of N to P that would be best for ecosystem functioning? (8) How reliable are current models for assessing the role of N in Lake Erie eutrophication and how can the models be improved to model the effects of N? In addition, the SAB recommends that best management practices (BMPs) be developed or applied to achieve N reduction in Lake Erie, and "lessons-learned" case studies of nutrient reduction strategies for the Baltic Sea, Gulf of Mexico, and other areas be applied to Lake Erie. Agricultural BMPs for P may help to control N but may not be sufficient to attain the degree of N control that could be necessary.

Assessing Progress in Reducing Tributary Loadings of Phosphorus

The SAB was asked to comment on the use of flow-weighted mean concentrations (FWMC) and other approaches that should be considered to account for inter-annual variability in hydrology when assessing progress in reducing tributary loadings of P to Lake Erie. The FWMC is the preferred approach for calculating average concentrations in tributaries with variable flows. To determine FWMC, the concentration in each sample is weighted by both the accompanying time interval and the flow. The Task Team has recommended using FWMCs of P in Lake Erie tributaries as a benchmark to track progress in load reduction. A flow-weighted mean concentration normalizes loadings with respect to flow so that year-to-year progress in nutrient control is not confounded by variability in inter-annual hydrology. This is a useful approach but the SAB recommends that all available monitoring data (discharge, flow, concentrations and loads) from significant tributaries and multiple assessment approaches (including FWMC and flow adjusted concentrations) be reviewed and used to evaluate controls on nutrient loadings. FWMC analysis alone may mask elevated concentrations of nutrients that can result in algal blooms. Nutrient concentration (affected by nutrient loading) controls organism responses, and the effect of temporal variability in nutrient concentration is an important consideration in the management of harmful algal blooms, particularly for organisms that have rapid life cycles and a rapid response to shifts in nutrient concentrations. The SAB notes that flow adjusted concentrations (relating nutrient concentration to discharge flow) have been used to remove seasonality from tributary monitoring data and more clearly identify annual trends.

The SAB recommends that the uncertainty in values derived using flow-weighted or flow-adjusted assessment approaches be explicitly quantified and presented, and that detailed information on the implementation of P reduction strategies be collected. Without this information, it will not be possible to

[2] DNRA is dissimilatory nitrate reduction to ammonium, NO3- to NH4+. It is a transformation (not a removal) process

identify the primary reasons for observed changes in P loads delivered to the Lake. If control of nutrients other than P (e.g., N, silica, or other micronutrients) is considered, the SAB recommends that the same assessment approaches be applied to tributary monitoring for those nutrients in order to evaluate efforts to control sources of loadings.

Adaptive Management Program

The SAB was asked to comment on the key elements that should be included in an adaptive management program to implement and evaluate nutrient reduction goals for Lake Erie. The SAB was also asked to comment on the value of using existing eutrophication models to periodically evaluate P loading targets and key response indicators. The SAB strongly endorses development of an adaptive management program to implement and evaluate nutrient reduction goals for Lake Erie and recommends that the EPA formally appoint a standing committee to develop and coordinate adaptive management. The program should test alternative hypotheses and associated conceptual models that can be used to adjust management operations and guide future monitoring and modeling. It is beyond the scope of this report to develop a comprehensive list of alternative hypotheses for Lake Erie eutrophication. However, the SAB suggests a number of research, monitoring and modeling tasks that focus on nutrient-load reduction, control of cyanobacteria and *Cladophora* blooms and evaluating processes that influence hypolimnetic dissolved oxygen.

The adaptive management program should include long-term monitoring to assess whether loading and eutrophication response targets are being met. Long-term monitoring should involve: assessing P and N loading information and developing standardized protocols for loading estimates; maintaining and expanding current tributary monitoring; considering the potential for monitoring additional eutrophication response indicators; and collecting appropriate data to calibrate and validate models. The adaptive management committee should be tasked with evaluating alternative management strategies for Lake Erie eutrophication and evaluating future scenarios.

The SAB recommends that process-based eutrophication models be used as part of the adaptive management process (as previously indicated, consideration should be given to developing one process-based model). These models can be used to make annual predictions of eutrophication response indicators and to test alternative hypotheses. The SAB recommends that: the models be refined based on changing loadings and other new data; future scenarios be evaluated to understand the effects of climate variability, estimates of uncertainty be improved in the models; lake models be linked to upstream source functions through watershed modeling; and that cases where models do not perform well be used to develop alternative hypotheses.

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2. INTRODUCTION

EPA Region 5 is co-leading a binational workgroup to develop and implement the Nutrients Annex ("Annex 4") of the 2012 Great Lakes Water Quality Agreement (GLWQA). Under Annex 4 the U.S. and Canada committed to address eutrophication issues in Lake Erie by first establishing phosphorus (P) objectives, loading targets and allocations for nearshore and offshore waters and subsequently developing P reduction strategies and domestic action plans. In December 2014, the EPA received early advice from the SAB on a modeling approach to develop P reduction targets (U.S. EPA Science Advisory Board 2015). A binational workgroup of scientists (The Annex 4 Objectives and Targets Task Team Modeling Subgroup) then used a suite of models to generate a series of load-response curves to simulate the impact of P loads on cyanobacteria biomass, hypoxia and *Cladophora* growth. An ensemble modeling approach was considered for this analysis but the load-response curves were generated by running the models individually. These load-response curves were used by the Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team (Task Team) to identify P reductions needed to meet indicator thresholds that reflected desired ecological conditions for Lake Erie.

The SAB provided early advice to the EPA on the proposed ensemble modeling approach for developing P targets for Lake Erie (U.S. EPA Science Advisory Board 2015). The EPA then requested that the SAB review the modeling results and process used to develop P load reduction targets for the Lake. In addition, the EPA requested advice on an adaptive management approach to periodically evaluate the nutrient reduction targets. The agency submitted two documents to the SAB for review: (1) a report titled *Annex 4 Ensemble Modeling Report (May 2016 Peer Review Draft)*, and (2) a report titled *Recommended Phosphorus Loading Targets for Lake Erie, Objectives and Targets Task Team Final Report to the Nutrients Annex Subcommittee (May 11, 2015)*.

The SAB was asked to respond to six charge questions that focused on: (1) the adequacy of the evaluation of the models used to develop load-response curves; (2) whether the recommended P load reduction targets are based on the best available information on drivers of cyanobacteria growth and seasonal hypoxia in Lake Erie; (3) whether scientifically-sound P load reductions can be developed to address the problem of *Cladophora* growth in Lake Erie; (4) whether nitrogen (N) control, in addition to P, is warranted in Lake Erie to prevent harmful algal blooms and manage hypoxia; (5) approaches to account for inter-annual variability in hydrology when assessing progress in reducing loadings of P to Lake Erie; and (6) an adaptive management approach to implement nutrient reduction goals for Lake Erie. In response to the EPA's request the SAB convened its Lake Erie Phosphorus Objectives Review Panel to conduct the review. The Panel held a public meeting on June 21-22, 2016 and teleconference meetings on October 12 and 13, 2016 to deliberate on responses to the charge questions and develop a consensus report of its findings and recommendations. The Panel's draft report was reviewed and discussed by the chartered SAB at a teleconference on <<*insert date*>>. This SAB report provides the findings and recommendations of the SAB in response to the EPA charge questions (Appendix A). Key recommendations are highlighted at the end of each section of the report. The key recommendations are grouped to provide a relative indication of whether it may be most appropriate to implement them in the short, intermediate, or long term. This listing is intended to offer suggestions that may be helpful to the EPA in deciding how and when to allocate resources to support this work.

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3. RESPONSES TO EPA'S CHARGE QUESTIONS

3.1. Approach for Developing Lake Erie Phosphorus Load Reduction Targets

The Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team Modeling Subgroup (Modeling Subgroup) evaluated nine models to predict the response of selected eutrophication response indicators (ERIs) to different P load scenarios. Four response indicators were considered and evaluated: (1) overall phytoplankton biomass, as represented by chlorophyll a; (2) cyanobacteria blooms in the Western Basin; (3) hypoxia in the hypolimnion in the Central Basin; and (4) *Cladophora* in the nearshore areas of the Eastern Basin.

The document, *Ensemble Modeling Report (May 2016 Peer Review Draft)* (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team Modeling Subgroup 2016) describes evaluation of the models and development of load-response curves for the selected ecosystem response indicators (ERIs) for Lake Erie. These load-response curves were used to develop P reduction targets to meet thresholds of desired ecological conditions for Lake Erie (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015). The SAB was asked to comment on: whether the evaluation of the models by the Modeling Subgroup was adequate to inform interpretation of model results; whether additional analyses were needed to improve development and interpretation of load-response curves; whether the recommended targets reflect the best information on the drivers of cyanobacteria growth and seasonal hypoxia; and whether the recommended targets are appropriate to meet the nutrient objectives defined in the Great Lakes Water Quality Agreement.

3.1.1. Evaluation of the Models to Inform Interpretation of Results

> *Charge Question 1. Please comment on whether the evaluation of the models was adequate to inform how model results should be interpreted, given differences in model complexity and scale. Please identify any additional analyses that may be needed to improve future development and interpretation of the load-response curves for the eutrophication response indicators.*

The SAB broke the response to this charge question into two sub-questions:

1. Was the evaluation of the models adequate to inform how the model results should be interpreted?

2. What additional analyses may be needed to improve future development and interpretation of the load-response curves?

Model Evaluations

The original approach for developing Lake Erie P load reduction targets, as described by the EPA in a 2014 consultation with the SAB (U.S. EPA Science Advisory Board 2015), was to estimate load-response curves from multiple models and combine these into a single model or ensemble estimate. However, the models were applied and evaluated independently and were not used to develop an ensemble estimate. The independent model evaluations were intended to ensure that the results of each model met standards that would provide confidence that the model-generated load-response curves

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could be regarded as reasonably accurate and reliable. While adequate in concept, the criteria[1] used for the model evaluations were only loosely applied and models were accepted despite deficiencies relative to the criteria. For example, the Estuary, Lake and Coastal Ocean Model (ELCOM) was accepted and used to develop a load-response curve for Lake Erie Central Basin hypoxia despite having not been calibrated to Central Basin dissolved oxygen. A sensitivity analysis was not performed for the ELCOM. The Modeling Subgroup's use of a common set of metrics to evaluate model fit is admirable; however, these metrics were not uniformly applied across the suite of models. In addition, if prediction is a goal of management, the evaluation should have included a predictive measure of fit. The standard measures of goodness of model fit are not predictive,[2] and Modeling Subgroup assessments of the quality of the fit may be optimistic for purposes of nutrient management.

The model evaluations had other limitations: these evaluations did not characterize the relative strengths of each model or the consistency of descriptions of underlying key processes; and the suite of load-response curves were treated as equally likely, despite significant differences in estimated load and uncertainty. The SAB finds that the assessed models are not of equal reliability and that the assessment of load-responses would have benefited by giving greater weight to response curves generated by the models deemed most reliable.

The overall model evaluation included efforts to characterize model uncertainty. The approaches used to quantify model uncertainty differed among the models and, as a result, the assessed uncertainties cannot be readily compared across models. Perhaps most importantly, the model uncertainties were not used to evaluate the likelihood that the chosen loading targets would achieve the desired thresholds of ecosystem response. While it is clear that meeting the loading targets would lead to improved values of the selected ecosystem response indicators, other important outcomes are less clear. These include the likelihood that the desired threshold levels would be achieved; how long it would take for improvements to occur after the loading is reduced; and the effect of variations in hydro-meteorological forcing and timing of loading on responses to load reduction.

Improving Future Development of the Load-Response Curves

Given the limitations of a number of the models used in the analysis and the practical limits of funding, the SAB recommends reducing the number of models considered. Priority should be given to the process-based models that can account for the response of key environmental processes to changes driven by load reductions, climate changes and internal storage and recycling of nutrients. This recommendation comes with the recognition that such models should have process descriptions consistent with current technical ability to measure and model those processes. That is, the models should not have process resolution that cannot be parameterized based on measurements. It might prove most efficient to choose a single model and to further develop that model using the insights and demonstrated capabilities provided by the other models and the results of ongoing process research and

[1] The Task Team Modeling Subgroup applied the following criteria to evaluate the models: 1) ability to develop load response curves or provide other output for quantitative understanding of relevant questions; 2) applicability to objectives and metrics of interest; 3) extent and quality of calibration and confirmation; 4) extent of model documentation; and 5) level of uncertainty analysis available.

[2] Goodness of fit is a measure of how well the model fits the data already used to estimate its parameters; predictive fit is a measure of the model's accuracy in predicting future data.

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monitoring. Consideration should be given to making Western Lake Erie Ecosystem Model (WLEEM) the consensus model for this purpose, with a goal of extending this model to all of Lake Erie.

Analyses of the ability of the chosen model(s) to predict responses to changing conditions should be conducted on an ongoing basis. Research and model development work should be funded to improve model accuracy and reliability within the overall nutrient-loadings management and decision-making framework. This continued model evaluation and refinement would facilitate making the model or models useful operational tools as part of an ongoing adaptive management process.

The models are limited by the data available for calibration and validation, which affect the ability to rigorously evaluate model quality. The EPA should seek a better understanding of the limitations of the data and the data requirements needed to produce higher certainty in estimates. Additional in-lake synoptic sampling of key variables such as vertically averaged cyanobacteria abundance, water column and surface sediment nutrients (e.g., N and P), total suspended solids (TSS), and dreissenid mussel biomass) should be conducted on an ongoing basis to support model evaluations and refinements.

Measurements of flow, TSS and nutrient concentrations in all the significant tributaries to Lake Erie should be made at sufficient frequency each year to make accurate estimates of loading, particularly during the March to July period. While there is adequate information available on historical loading from major tributaries (e.g., the Detroit River and the Maumee River), there is inadequate information available on small[3] tributaries. It would be useful to develop a model of nutrient and TSS loading that includes inputs from small tributaries. This would most likely be a hierarchical or Bayesian hierarchical model that accounts for multiple factors. Additional monitoring might be required for adequate estimation of model parameters and subsequent estimates of nutrient loadings from the small tributaries.

It seems worthwhile to improve the estimates of loading by linking land use models with loading models to achieve a realistic picture of the landscape-level interactions that are likely to produce in-lake changes (e.g., algal blooms, hypoxia, and *Cladophora* growth). Correspondingly, there might be an opportunity to collaborate with farmers who are practicing precision agriculture in the Lake Erie watershed to better estimate optimal fertilizer application rates as a way to reduce nutrient loading. The EPA should seek opportunities to collaborate with the U.S. Department of Agriculture (USDA) to increase local farmers' use of agricultural technologies aimed at more efficient use of fertilizers and reducing nutrient loadings to Lake Erie.

If multiple models are retained for use in the analysis, model estimates should be combined using either likelihood-based methods or Bayesian model averaging to produce a combined model-weighted quantitative characterization of the loading curve and associated uncertainty.

[3] For the time period 2011-2013, flows from the Detroit River contributed 94% of the flow into the Western Basin of Lake Erie and flows from the Maumee River contributed 4% of the flow into the Western Basin (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015). Small tributaries do not contribute significantly to the total discharge but they may have high concentrations of phosphorus. Maccoux et al. (2016) have estimated phosphorus loading for Lake Erie tributaries.

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Key Recommendations

Short Term:

- Because the models used in the analysis are not of equal reliability, the SAB recommends that the assessment of load-responses be improved by giving greater weight to response curves generated by the models deemed most reliable.

- Given the limitations of some models used in the analysis and the practical limits of funding, the number of models considered should be reduced and priority should be given to the process-based models that have the capability to account for the response of key processes. It might prove most efficient to choose a single model and to further develop that model using the insights and demonstrated capabilities provided by the other models and the results of ongoing process research and monitoring. Consideration should be given to making the Western Lake Erie Ecosystem Model (WLEEM) the consensus model for this purpose, with a goal of extending this model to all of Lake Erie.

- Research and model development work should be funded to improve model accuracy and reliability within the overall nutrient loadings management and decision-making framework.

- The EPA should investigate when and where data collection is needed to best inform the models and reduce model and estimation uncertainty. Additional in-lake synoptic sampling of key variables such as vertically averaged cyanobacteria abundance, water column and surface sediment nutrients (e.g., N, P), TSS and dreissenid mussel biomass should be conducted on an ongoing basis to support model evaluations and refinements.

- Measurements of flow, TSS and nutrient concentrations in all the significant tributaries to Lake Erie should be made at sufficient frequency each year to determine accurate estimates of loading, particularly during the March to July period.

- Estimates of loading should be improved by linking land use models with loading models.

Intermediate Term:

- Analyses of the ability of the chosen model(s) to predict responses to changing conditions should be conducted on an ongoing basis.

- If multiple models are retained for use in the analysis, model estimates should be combined using either likelihood based methods or Bayesian model averaging to produce a combined-model weighted quantitative characterization of the loading curve and associated uncertainty.

Long Term:

- A model of nutrient and TSS loading that includes inputs from small tributaries should be developed.

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3.1.2. Phosphorus Loading Targets

Charge Question 2. Please comment on whether the recommended targets reflect the best available information on the drivers of cyanobacteria growth and seasonal hypoxia in Lake Erie and are appropriate to meet the nutrient Lake Ecosystem Objectives defined in the GLWQA (as reflected in Table 1 on page 7 of the document titled Recommended Phosphorus Loading Targets for Lake Erie).

The Annex 4 Objectives and Targets Task Team (Task Team) recommended a target of 40% reduction in the total P (TP) load to the Central and Western Basins of Lake Erie (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015). This is based upon the results from the suite of models that compute load-response relationships between metrics of eutrophication response indicators, namely harmful algal blooms (HABs) and hypoxia, and loads leading to values for those metrics. The principal issues considered by the SAB were: (1) whether this target of a 40% reduction (from a 2008 baseline which is essentially equivalent to the current target load of 11,000 MT) is based on and results from a rigorous analysis and modeling framework (reflecting the drivers of cyanobacterial growth and seasonal hypoxia), and (2) whether such a reduction will meet the Lake Erie Ecosystem objectives[4].

In general, the SAB finds that, while the models used in the analysis vary in complexity and assessment of uncertainty, and not all incorporate the same level of process dynamics, their congruence provides sufficient confidence in the stated recommended target P load. A 40% reduction represents a major and substantial decrease in P inputs, but is in keeping with reductions deemed necessary in other aquatic environments suffering similar ecosystem impairments (e.g., Chesapeake Bay, Tampa Bay, and the Gulf of Mexico); therefore, by comparison, the recommended magnitude of the load reduction target does not seem unreasonable. However, it should also be recognized that the P load-response curves were generated from models that have been developed over the past 40 years. There are compelling reasons to believe that the lake ecosystem has changed since 1995 and these models may no longer provide reliable responses to P load reductions. In general, the models disregard the potential role of "legacy P" in sediments and the role of other elements (e.g., N and Si) in controlling blooms of phytoplankton populations, which may compromise the rate and extent of ERI responses to external P load reductions.

Drivers of Cyanobacteria Growth and Seasonal Hypoxia

The principal driver for the models used in the analysis and their results is stimulation of primary production by P loading which leads to excessive algal growth, harmful algal blooms and the production of cyanobacterial toxins, principally microcystin – for which the World Health Organization (WHO) drinking water limit is 1 part per billion (ppb) free plus cell bound (WHO 2003). Concentrations of microcystin have exceeded 1,200 ppb in the Western Basin of Lake Erie. While the target load reductions appear adequate to reduce cyanobacterial blooms, they do not ensure that toxin levels will be reduced to levels that no longer pose health threats. The controls on toxin production are not well understood and represent an important research need.

[4] The desired thresholds identified for eutrophication response indicators in Lake Erie were: (1) Western Basin cyanobacteria bloom biomass no less than that observed in 2004 or 2012, nine years out of ten, and/or reduced risk of nearshore localized blooms; and (2) Central Basin hypoxia August-September average hypolimnetic dissolved oxygen concentration of 2.0 mg/L or more (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015).

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A secondary effect of excessive algal growth is the rapid deposition of algal-derived, labile detrital organic matter that enhances consumption of dissolved oxygen leading to the formation of extensive zones of hypoxic hypolimnetic waters in the Central Basin of the Lake during thermally stratified summertime conditions.

The relationships developed between P loads and ERIs are inherently approximate, variable and relatively uncertain. This is in part due to the relative simplicity of the models in attempting to reproduce a very complex ecosystem having a very large degree of natural biological and hydrodynamic variability. Clearly not all processes are modeled, and the process modeling is not always conducted at a level of temporal and spatial resolution that would resolve all the active dynamics. As further discussed below, some processes and dynamics are missing. However, the basic relationship between P loading and algal production, though highly variable and likely influenced by other biogeochemical processes, is deemed central and definitive for Lake Erie. Most telling in this regard is the simple observation of a direct relationship between extent of cyanobacterial blooms and the spring P loading to the Western Basin (see Stumpf et al. 2012; Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015). A notable example is the dramatic difference between the 2011 and 2012 blooms. The 2011 bloom was the largest on record until 2015. In 2012, the spring P load was approximately one sixth of the 2011 P load, and the corresponding 2012 bloom was only about 10% of the 2011 observation. The Lake Erie system clearly appears to respond to changes in P loading with a strong correlation generally captured by the models. It must be recognized that other biogeochemical processes, including N and silica cycling, are important. However, the SAB finds that setting P loading as the initial driver in the Lake Erie system is appropriate and is consistent with the evidence.

The SAB recognizes that the focus of abatement programs should be on reducing those components that readily support growth of phytoplankton communities. This implies that a focus should be placed on reduction of soluble reactive P (SRP) that is generally regarded as completely available, as well as those fractions of total P (TP) that may be partially available to phytoplankton (e.g., certain particulate P and dissolved organic P [DOP] fractions). For example, in the Maumee River on average in 2002-2013 only about 45% of the TP load was actually bioavailable, and although SRP makes up only 21% of the average TP load, SRP makes up about 46% of the average bioavailable load.[5] The mineralization of organic phosphorus to orthophosphate is a pathway to bioavailability for part of the nonreactive phosphorus component of total dissolved phosphorus. However, Baker et al. (2014a) found that in the Maumee River at Waterville, Ohio, the conversion of dissolved organic phosphorus to orthophosphate added little to the bioavailable P loads entering the Lake. Gradient driven desorption of orthophosphate from particulate phosphorus provides a pathway to bioavailability for particulate phosphorus. However, the portion of the particulate phosphorus that is chemically or physically bioavailable may not support algal growth if that sediment is deposited or buried prior to orthophosphate release to the water column. A study of storm water movement through the lower Maumee River and Maumee Bay showed substantial deposition of sediment between the Waterville, Ohio sampling station and Maumee Bay (Baker et al, 2014b). These observations of sediment deposition underscore the relative importance of SRP loading as a driver of cyanobacterial blooms. Moreover, a recent study indicates that changes in agricultural practices, including some conservation practices designed to reduce erosion and particulate

[5] Comments to the Science Advisory Board from Dr. David. Baker, October 24. 2016, available at: https://yosemite.epa.gov/sab/sabproduct.nsf/AF08F14F2631437D85258057007053C8/$File/Comments+from+David+Baker,+Heidelberg+University.pdf

P transport, may have had unintended, cumulative, and converging impacts contributing to increased SRP loads to Lake Erie during the past 20 years (Jarvie et al. 2017).

The SAB notes that some of the process models do include other nutrients (N and silica) and other algal speciation and as such do not totally rely on P loading to drive the system. In fact, nitrate concentrations in the Maumee River have actually been decreasing and the relationship between P and N is not one of simple stoichiometry. As discussed in Section 3.3.1 of this report, taking a dual nutrient management approach in Lake Erie clearly warrants investigation, and is currently limited by a lack of data, primarily on N cycling. The algal community in Lake Erie should be characterized to better understand the relative contribution of N-fixers versus non-fixers. The role of both N-fixation and denitrification in N cycling and N budgets in the system should also be assessed. This will provide information about the importance of N limitation and the potential impact of N reduction strategies (i.e., if N is low, it might stimulate N-fixing species).

The forms of P coming off the landscape are also critical to changes within the Lake Erie system . While TP load has not changed significantly (i.e., there has been no long term trend up or down, even though year to year variation has been high), the fraction of this TP that is "bioavailable" has increased significantly in the last 20 years. This appears to be one of the drivers of cyanobacterial growth, although it should be noted that "turning off" SRP in the models does not reduce cyanobacteria growth enough to reach the maximum allowable cyanobacterial mass in established objectives (i.e., particulate P also plays a role in cyanobacterial growth).

The timing of nutrient inputs is also important to cyanobacterial blooms. It would be useful to evaluate whether there has been an increase in frequency and magnitude of blooms in response to nutrient inputs over time and to recognize how the critical spring period may change or shift in the future.

Uncertainties in predictions of hypoxia are considerably larger than uncertainties associated with predictions of algal blooms. This is due to the fact that the extent and dynamics of hypoxia are confounded by many factors including physical processes, as well as biological processes such as the extent of the winter bloom. Furthermore, whereas the connection between P loads and algal production is relatively direct, the connection between P loading and Central Basin hypoxia is not. Hypoxia is propagated through several functions from P loading to algal production, to rapid deposition of algal detritus, to benthic metabolism and respiration, to oxygen depletion and hypoxia and the potential flux of SRP and dissolved inorganic N (DIN) from the sediment bed during hypoxic events. These functions, in turn, are heavily modified by thermal stratification driven by both short term physical mixing and long term regional climate change. Hence, the lack of a direct relationship between P loading and hypoxia is to be expected, since (in the words of Professor Clifford Mortimer of the Center for Great Lakes Studies at the University of Wisconsin-Milwaukee) "many other spoons stir the pot." These processes may influence whether hypoxia targets (see footnote 3 of this report) are achievable, and certainly impact the ability of the models to capture the dynamics of hypoxia and predict a robust relationship between P loading and oxygen depletion in the Central Basin. Better parameterization of benthic metabolism and sediment oxygen demand is necessary as well, through inclusion of explicit sub-models of sediment diagenesis.

One current weakness of the evaluation of the hypoxia simulation models derives from the fact that these process models, which can be run for multiple years, have only been run as one year simulations using the same initial boundary or starting conditions in each case. This means that the development or

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accumulation of a forwarded residual of "legacy" P or organic matter over time is not currently simulated. This accumulating residual, which would affect the response time of the system to a reduction in loading, is present in both the Western and Central Basins of Lake Erie (Carrick et al. 2005). This response time is probably related to the residence time of metabolizable material and the build-up of reduced chemical species in the sediments that may prolong hypoxia. In some systems this has resulted in a lag in response to loading reductions on the order of years (Jeppesen et al. 2005; Matzinger et al. 2010).

The rationale for an August-September hypolimnetic oxygen tolerance of 2 mg/L, as opposed to a more stringent 4 mg/L which would require a greater P load reduction, is described in the document *Recommended Phosphorus Loading Targets for Lake Erie* (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015). Given the uncertainties in the hypoxia simulations, the SAB finds that 2 mg/L is a reasonable initial target. It should be noted, however, that even with a 40% reduction in P loading, the dissolved oxygen water quality standard of 5 mg/L will, almost certainly, not be met in Central Basin bottom waters and the predicted hypoxic area will range from approximately 2,000 to nearly 6,000 km^2 for periods in excess of a month. The WLEEM is a process-based model that can provide information on the relationship between loadings of water, sediments, and nutrients and the responses of algal biomass and turbidity/sedimentation. The SAB recommends that the WLEEM be deployed for the whole lake in order to provide information to better understand how load reductions impact hypoxia development.

Missing Components of the Models

The Modeling Subgroup acknowledged that some of the simulation models used to develop load-response curves had missing components (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team Modeling Subgroup 2016). Undoubtedly missing components reflect a variety of processes that are absent or minimally incorporated into the models, although some models are capable of including these processes in future renditions. Such missing components include:

- Temporal variability in the underlying hydrodynamics (e.g., strength and propagation of the Detroit River plume in controlling the water residence time and flushing of the western basin);
- Variations and the vagaries of weather for which the models have no simple means of inclusion;
- The role of N limitation, denitrification and N fixation;
- The controls of algal toxin production (not all *Microcystis* produces toxin, and there is some indication that N may play a role);
- The internal P loading and resuspension and sediment-water interactions in general – although the WLEEM does include a diagenetic sub-model based on a 10-cm thick sediment mixed layer (The SAB finds that a 10-cm thick sediment mixed layer may be too deep; approximately 5 cm would seem to be more appropriate and in agreement with radionuclide chronologies) (Klump et al. unpublished data 2006[6]; Robbins et al. 1977).
- Role of dreissenid mussels, the populations of which are likely not in steady state;
- Changes in seasonality (e.g., the timing and the biogeochemical composition of P in load delivery and how that is tied to activities in the watershed such as fertilizer application and tillage;

[6] Klump, J.V. Great Lakes Water Institute, University of Wisconsin-Milwaukee, Milwaukee, WI.

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- Changes in the P-uptake response of cyanobacteria and other algal species to TP and other forms of P (e.g., bioavailable forms) over time (there is clear evidence that the system continues to shift and that recent blooms are fundamentally different from those experienced in the 1970s); and
- Incorporation of winter-spring diatom blooms under the ice.

All of these issues were discussed to varying degrees by the experts who attended the SAB Lake Erie Phosphorus Objectives Review Panel meeting on June 21-22, 2016. Model predictions could be improved by undertaking work to incorporate these missing components. In particular, the SAB notes the importance of extending mechanistic models to include sediment diagenesis and nutrient flux (and refine the depths of the active layer) and incorporating the influence of winter blooms into the models. Consideration should also be given to embedding a *Cladophora* model within the whole lake WLEEM (the SAB's findings and recommendations concerning *Cladophora* growth are discussed in the response to Charge Question 3).

Importance of Climate Change

It has also been well recognized that, because of climate change, management practices put in place today may not result in the same ecosystem outcomes in the future (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015; Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team Modeling Subgroup 2016). The Task Team has indicated that achieving flow weighted mean concentration (FWMC) objectives for TP and SRP is expected to result in P loads below targets 90% of the time (i.e., 9 out of 10 years) "if precipitation patterns do not change" (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015). The Lake Erie region is projected to be both warmer and wetter in the future. As outlined by Bosch et al. (2014), projections of climate change scenarios include:

- Increased precipitation (~10-20%);
- Increases in the frequency of intense precipitation events (important in a system that is event driven, where perhaps 70% or more of the loading from the watershed occurs over 10-15 days of the year, and where high precipitation after fertilizer application is likely to be important);
- Expanded summertime conditions and a longer growing season;
- Prolonged thermal stratification and hypolimnetic sequestration;
- Changes in regional climatology and wind fields;
- Changing lake levels, which in Lake Erie have the potential to significantly change the thickness of the hypolimnion and its oxygen carrying capacity;
- Changes in ice cover – including extent, duration and timing; and
- Watershed changes (e.g., increases in crop production due to variables such as increased precipitation and atmospheric CO_2; increases in evapotranspiration rates, which in some systems actually is projected to decrease runoff; and changes in soil microbial activity).

The SAB notes that some of the models used by the Task Team to predict the response of selected eutrophication response indicators to P loading (e.g., WLEEM) are capable of incorporating elements of climate change scenarios.

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Effects of Phosphorus Load Reductions on Fish Production

Experts who attended the SAB Lake Erie Phosphorus Objectives Review Panel meeting on June 21-22, 2016 noted the concern of some resource managers that P load reductions could have a detrimental effect on fish production. To the contrary, reductions in P loading could shift algal speciation in favor of more species that are more palatable to primary consumers and may in fact enhance the food web by restoring a trophic pathway to secondary and tertiary production (Yurk and Ney 1989; Ludsin et al. 2001). Cyanobacteria have long been considered a poor quality food for key zooplankton grazers that link phytoplankton to higher trophic levels (Ali Ger et al. 2016). Therefore, at present, much of the primary production (cyanobacteria) in Lake Erie probably represents an ecological dead end (i.e., it does not enter the food chain but simply sinks to the bottom). Alterations in fish habitat and the abundance of mussels also have an effect on fish abundance but this effect is not well understood.

Appropriateness of the Phosphorus Load Targets

In general, the SAB finds that, based upon the coupling of current models to a relatively long term observational record, a 40% reduction in TP load to the Western and Central Basins projects an estimated response which improves water quality and reduces HABs in keeping with the stated goals in the Task Team report (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015). However, even with this reduction, cyanobacteria blooms may still occur with some frequency in the western arm of the western basin in Maumee Bay. Ultimately, greater load reductions may be necessary to achieve the desired thresholds for the ERI's. As previously noted, prediction of hypoxia is associated with a higher degree of uncertainty than prediction of cyanobacteria blooms. Therefore, attenuation of hypoxia is more problematic.

As previously mentioned, lake and tributary monitoring is critical for continued development of the models and for adaptive management. Lags in indicator response and inter-annual trends can only be elucidated accurately with an adequate monitoring program in place. In particular, monitoring of the 12 priority watersheds identified by the Annex 4 Objectives and Targets Task Team is essential and should include measurement of: precipitation, flow, N species (good *in situ* NO_3^- sensors are available for high temporal resolution sampling), P (all forms) and organic carbon (dissolved organic carbon [DOC] and particulate forms). Event based sampling (to capture the effects of the rising and falling limb) within these systems is also critical for calculating loads.

The SAB also finds that linking the in-lake models to models of nutrient loading in the watershed is essential, and is underway in some regions. The inclusion of these landscape models in the analysis is an inescapable necessity since actions and practices on the land will enable the 40% P load reduction to the Western and Central Basins.

Key Recommendations

<u>Short Term:</u>

- Lake and tributary monitoring should be conducted to support continued development of the models and adaptive management. In particular, event based sampling to capture the effects of precipitation and tributary flow is critical for calculating loads. Dissolved organic or non-reactive P in Lake Erie and tributaries should also be further investigated.

- Mechanistic models should be extended to include sediment diagenesis and nutrient flux. The depths of the active layer should be refined (e.g., 10 cm is too large - the depth may be 5 cm or less). This will require calibration of the mechanistic models to field and laboratory data specific to Lake Erie.

- If feasible, given the computational resources that may be required, simulations should be run continuously over a period of years as an extended sequence rather than resetting initial conditions every year.

Intermediate Term:

- If feasible, given the computational resources that may be required, the WLEEM should be deployed for the whole lake to provide information to better understand how load reductions impact hypoxia development.

- Consideration should be given to embedding a *Cladophora* model within the whole lake WLEEM.

- A better understanding of the influence of winter blooms (under ice phenomena) should be developed and incorporated into the models, particularly for hypoxia in the Central Basin.

- The algal community should be characterized to better understand the relative contribution of N-fixers versus non-fixers. The role of both N-fixation and denitrification in N cycling and N budgets in the system should be assessed.

3.2. *Cladophora* Growth

In its charge to the SAB, the EPA has indicated that additional P load reductions may be necessary to reduce nuisance levels of *Cladophora* in the nearshore waters of the Eastern Basin of Lake Erie. The SAB was asked to comment on whether scientifically sound P load reduction recommendations could be developed at this time to address *Cladophora* growth. In responding to this charge question, the SAB considered available information about *Cladophora* ecology, its occurrence in Lake Erie, the ecosystem consequences of *Cladophora* blooms and capabilities of the Great Lakes *Cladophora* Model.

3.2.1. Development of Recommendations to Address Nuisance Levels of *Cladophora* Growth

> *Charge Question 3. Can scientifically-sound phosphorus load reduction recommendations be developed at this time that will reduce Cladophora growth in the Eastern Basin of Lake Erie?*

The SAB finds that further research must be completed before scientifically sound P load reduction recommendations to reduce *Cladophora* growth in the Eastern Basin of Lake Erie can be developed. There is insufficient information available to understand and weigh the relative importance of environmental factors (including P inputs) that might have causal links to *Cladophora* growth and senescence. Moreover, there are limited observations of the spatial extent of a perceived *Cladophora* problem that seems to have been identified at sites along the shores of the Eastern Basin of Lake Erie. That said, the issue of nuisance *Cladophora* growth in nearshore regions has been identified as an important issue in the Great Lakes because it affects selected sites in each of the Great Lakes (Auer et al. 2010). This makes it a pressing regional issue in need of scientific and management attention.

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Basic Ecology of Cladophora

Cladophora glomerata is a macroscopic, filamentous, branched green alga (Chlorophyceae) that usually grows attached to hard benthic substrates in a variety of lakes, streams and rivers worldwide (Wehr et al. 2015). This alga can grow in such profusion that it forms extensive, dense mats achieving several meters in length. The occurrence of this alga is usually associated with ample nutrients (Dodds and Gudder 1982; Higgins et al. 2008). There is experimental evidence that *Cladophora* grows best under high concentrations of both N and P (e.g., Rosemarin 1982). Experimental enrichment of both N and P performed *in situ* in Lake Michigan has led to extensive growth of *Chaetophora*, a close relative to *Cladophora* (Carrick and Lowe 1988; 2007).

Occurrence of Cladophora in Lake Erie

Occurrences of *Cladophora* were reported in the Great Lakes as early as 1930 (Neil and Owen 1964). The distribution of *Cladophora* appeared to expand through the Great Lakes from 1960-1975, and this was attributed to large nutrient inputs in the nearshore regions of Lakes Huron, Michigan and Erie with biomass ranging from 100 - 800 g dry weight/m^2 (Auer et al. 1982). While the biomass declined during the 1970s and into the early 1980s coinciding with the P abatement programs in the Great Lakes, its abundance underwent a surprising upturn again in the mid-1980s and early 1990s (Higgins et al. 2008). More recently, standing crops up to 700 g dry weight *Cladophora glomerata*/m^2 have been observed in shallow nearshore waters (0.5 - 2 m depth) along the northern shore of the Eastern Basin; its occurrence in this location may be linked to the presence of suitable hard substrate as well as other factors. Hard substrate also supported colonization of dense populations of dreissenid mussels (*Dreissena polymorpha* and *Dreissena bugensis*), which may exacerbate the problem of *Cladophora* growth by increasing water clarity and enriching local regions with excreted nutrients, especially readily available P as SRP (Heath et al. 1995). Increased water clarity allowed *Cladophora* populations to develop to depths up to 20 m. Recent studies indicate that tissue content of P in *Cladophora* (i.e., P-quota) is an important metric of growth potential of this alga: tissue of <0.07 μg P/mg dry weight is unproductive; tissue of >0.20 μg P/mg dry weight is considered to be highly productive, capable of producing significant biomass, likely leading to significant sloughing and formation of large amounts of "beach muck" upon decomposition (Higgins et al. 2005, 2008; Lake Erie Millennium Network 2016). The levels of P storage in algal tissues appear to be useful indicators of aquatic ecosystem eutrophication and thus subsequent remediation (Price and Carrick 2016).

Ecosystem Consequences of Cladophora Blooms

Cladophora often plays a key role as an "ecosystem engineer" (an organism that alters the environment in a way that affects the other organisms present) and this can have both important positive influences as well as potentially negative consequences. This alga can serve as a substrate for epiphytic algal and bacterial assemblages, which may also contain invertebrates (Lowe et al. 1982; Stevenson and Stoermer 1982; Chilton et al. 1986). While it may not be fed upon directly by invertebrates and fish, as substrate it indirectly provides food for upper trophic levels. It is generally found in shallow, nearshore environments where turbulent wave action is common. Because of its turbulent environment, filaments frequently break or slough off, forming mats that can wash ashore and decay to a foul smelling mass (i.e., beach muck). The processes that lead to sloughing and decay of the standing crop are not well understood, and a recent workshop (Lake Erie Millennium Network 2016) identified *Cladophora*

senescence and decay as a necessary research topic. As this "muck" decays, it gives off noxious odors, and provides a habitat for biting flies and a substrate for *E. coli* and the bacterium responsible for avian botulism. Because of its ability to scavenge and store excess P, *Cladophora* has often occurred as a nuisance alga, capable of growing to large standing stocks leading to beach fouling as large stands of "muck." Although there is no stated limit of acceptable standing crop, it is generally considered that less than 30 g dry weight /m^2 is indicative of "good" conditions (Lake Erie Millennium Network 2016). Biomass density of greater than 50 g/m^2 has been suggested as the threshold for the onset of problem conditions (Auer et al. 2010).

The Great Lakes Cladophora Model (GLCM)

The Great Lakes *Cladophora* Model (GLCM) is a mechanistic, mass balance model with two state variables, net algal biomass (growth minus respiration and sloughing) and stored P. The forcing conditions are: available SRP, incident light intensity and temperature (see Appendix B-9 of Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team Modeling Subgroup 2016). The model was calibrated by direct observation in the field (Lake Huron) and laboratory studies; it was confirmed by comparing the fit of model predictions to observations in Lake Michigan. *Cladophora* growth may be linked to SRP content in the overlying water column and ultimately with the P-quota. The SRP in the overlying water column is influenced by local inputs from nearby tributaries, as well as the presence and density of dreissenid mussels (Higgins 2004). Therefore, a scientifically-sound model must incorporate site-specific factors, including local hydrodynamics.

Sensitivity analysis has indicated that the model is most sensitive to the minimum cell P-quota, the maximum growth rate and the maximum respiration rate; it is marginally sensitive to parameters related to phosphate uptake. Model curves for SRP vs. maximum standing crop and SRP vs. stored P content show that SRP of 0.9 µg P/L would yield a maximum standing crop of 30 g dry weight/m^2 and a stored P content of 0.075 percent P. That is, 0.9 µg P as SRP/L would yield an acceptably low standing crop and low growth potential for *Cladophora*. This level of SRP has been related to TP concentrations and total P load to Lake Erie via load-response curves derived empirically and illustrated in Figures B9-2 and B9-3 in Appendix B-9 of the *Annex 4 Ensemble Modeling Report* (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team Modeling Subgroup 2016). This analysis implies that *Cladophora* growth and P-quota could be controlled with a TP load reduction to 7,000 MT/year, or a load reduction of 25 percent. A goal of 40 percent reduction in TP load to Lake Erie was recommended by the Task Team to attain other desired ERI thresholds; the implication of the GLCM analysis is that meeting this goal would also reduce *Cladophora* growth.

The GLCM appears to provide a first order evaluation of *Cladophora* occurrence and initial predictions regarding attainment of the ERI of reduction of *Cladophora* standing crops to acceptable levels with little growth potential, as indicated by P-quota. However, further research must be completed to fill knowledge gaps (listed in the key recommendations below) before recommendations for P load reductions to reduce *Cladophora* growth can be developed with an adequate level of certainty and scientific confidence. In this regard, it is particularly important to link the data needs of the model with the data collection process. The EPA should evaluate data needs to reduce uncertainty in the model and better predict algal growth and presence.

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Key Recommendations

Short Term:

- The GLCM should be calibrated and confirmed in the Eastern Basin of Lake Erie using existing data.

- Site specific factors, including local hydrodynamics, tributary inputs, mussel densities, and other important drivers, should be incorporated into the GLCM.

Intermediate Term:

- Current and future studies should include investigation of P load inputs from key tributaries (e.g., the Grand River Ontario) and the relative significance of local inputs and open lake P on stimulating and supporting *Cladophora* growth.

- The process or processes that lead to sloughing (local hydrodynamics, algal senescence, etc.) and eventual decay of *Cladophora* to "beach muck" need further investigation and likely need to be appended to the GLCM.

- The development of a spatial model linked to remote sensing information should be explored to better understand *Cladophora* distribution.

- The GLCM should be included in a broader whole-lake model to forecast the likelihood of *Cladophora* growth along the shores. Consideration should be given to the possibility that as hazardous algal blooms abate, the likelihood of *Cladophora* growth along the shores may be increased due to improvements in water clarity and colonizable habitat.

Long Term:

- The GLCM would be more useful if it could be applied to the diversity of important benthic algae (e.g., *Chara, Lyngbya, Spirogyra,* etc.) that can cause similar problems in the Great Lakes. The similarities and differences among these various species should be considered in order to provide an adequate representation of the problems of nuisance benthic algae in general.

3.3. Nitrogen Control

The current nutrient strategy for Lake Erie focuses on limiting P loading to the Lake. However, the Task Team has also recommended tracking tributary N loads to the Lake. The EPA has asked the SAB to provide recommendations to help determine whether consideration of N control is warranted.

3.3.1. Determining Whether Nitrogen Control is Warranted

> *Charge Question 4: What recommendations can the SAB provide for development of an approach to help determine whether consideration of nitrogen control, in addition to phosphorus, is warranted in Lake Erie to prevent harmful algae blooms and manage hypoxia? In*

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particular, what questions, relationships, or research priorities related to nitrogen loading (different forms and sources) and in-lake cycling must be addressed?

The EPA and the European Commission have adopted a dual nutrient reduction strategy, including both N and P, to prevent and reduce eutrophication of both inland and coastal waters (European Commission 2009; U.S EPA 2015) While P has always been considered the limiting nutrient for Lake Erie and most other lakes, there is increasing evidence of the possible need for N control as well. The Baltic Sea can be viewed as a model that exemplifies the strategy to control both N and P. Although the Baltic Sea has some similarities to Lake Erie, most of the Baltic is estuarine but of low salinity. The importance of N control in lakes is currently unsettled and is the subject of vigorous scientific debate (Paerl et al. 2016; Schindler et al. 2016). While N control in Lake Erie may be premature, especially given its difficulty and expense, additional research to determine the importance of N should be a high priority. In Lake Erie, phytoplankton species composition and seasonal succession can vary with both N and P concentrations and ratios, and thus phytoplankton biomass does experience co-limitation of N and P during late summer and early fall (Moon and Carrick 2007). The phytoplankton species composition in western Lake Erie has changed over time, likely reflecting changes in N and P inputs and cycles due to changes in agriculture, the invasion of dreissenid mussels, climate change and other causes (Smith et al. 2015). N and P cycles are both coupled and uncoupled. Both nutrients are required in algal biomass in roughly Redfield ratios (106:16:1 C:N:P), but are cycled differently through the environment. N can be internally removed by a number of biotic and abiotic processes including: denitrification, anaerobic ammonium oxidation (anammox) and transformed by dissimilatory nitrate reduction (DNRA), and ammonia volatilization. Nitrogen cycling is likely influenced by the presence of dreissenid mussels (Svenningsen et al. 2012) and this may in turn affect N:P stoichiometry and nutrient availability to phytoplankton and macroalgae. Rates of internal N and P cycling are important as well as the loading rates. As further discussed below, three of the Lake Erie models currently incorporate N cycling but none address internal N and P pools, fluxes and ratios.

Need for a Multiple Nutrient Strategy

There is increasing support for adopting a multiple nutrient strategy to reduce eutrophication, in both fresh and salt waters (Conley et al. 2009; U.S. EPA 2015). For Lake Erie this means that, after the initial consideration of P control, N and P control should be considered; this would be similar to the approach taken for the Baltic Sea (Conley et al. 2011). Many documents urge additional control of external P loading in the Lake Erie watershed (e.g., Stumpf et al. 2012; Michalak et al. 2013; IJC 2014; Scavia et al. 2014; Dove and Chapra 2015; Powers et al. 2016); however, there is evidence that N control is also needed (Chaffin et al. 2013; Davis et al. 2015). As previously noted, the toxic cyanobacterium *Microcystis*, the major concern in western Lake Erie, does not fix N and therefore requires a fixed N source. *Microcystis* can become N limited in late summer in western Lake Erie (Chaffin et al. 2013). In addition, it becomes more toxic when nitrate is abundant in lake water (Harke et al. 2016). Furthermore, *Microcystis* is very well adapted to obtaining P when levels of P are low in lake water because it can use enzymes (e.g., alkaline phosphatase) to remove P from organic compounds (hydrolyze phosphate esters) that are more readily abundant in lake water in comparison to simpler dissolved forms of P (Harke et al. 2016). While nitrate is the predominant form of N in Lake Erie and is highly mobile, there are also lower levels of ammonium and other reduced N compounds (Chaffin et al. 2013) in the Lake. Since these other reduced N compounds can be readily used by most cyanobacteria, they could be significant contributors to blooms, even at low concentrations.

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The Maumee River drains a mostly agricultural watershed and discharges into the Western Basin of Lake Erie, where annual cyanobacterial blooms have occurred since the mid-1990s. Stow et al. (2015) document a decrease in total N (TN) load from the Maumee River since 2000 (despite concurrent increases in discharge). They also provide evidence for decreased nutrient inputs in summer months (May-July) in recent years, and seasonal shifts in the TN:TP ratio (decrease in March-April; increase in September-November). Recent cyanobacterial blooms in the Western Basin are fundamentally different from those occurring in Lake Erie prior to the P load reductions implemented in the 1970s. While most blooms prior to the 1990s were comprised of filamentous, heterocystous cyanobacteria (e.g., *Aphanizomenon*, a potential N-fixer), the modern blooms are comprised mostly of the non-N-fixing genus *Microcystis* (Steffen et al. 2014). The inability of these cyanobacteria to fix atmospheric N suggests an important role for external N loads from the watershed as well as an essential role of internal N recycling mechanisms in modulating the total biomass and especially the composition of the cyanobacteria community in the Western Basin. In addition, the toxin produced by *Microcystis* (and other cyanobacteria), microcystin, contains a large proportion of N (10 N atoms per molecule), and production of microcystin is strongly correlated with available N (Davis et al. 2015). This apparent N problem in Lake Erie is not confined to the *Microcystis* blooms in the Western Basin. Indeed, algal blooms in other parts of the Lake, including annual *Planktothrix* blooms in Sandusky Bay, Ohio (Davis et al. 2015) and ongoing blooms of *Cladophora* (Davies and Hecky 2005), also involve non-N-fixing algae. Furthermore, the proliferation of nuisance benthic algae (e.g., *Cladophora* and closely related species) has been experimentally and empirically linked to available N and P enrichment in the Great Lakes (See Carrick and Lowe 1988, 2007),

Low availability of N in lake water is associated with a switch between species of cyanobacteria (from the occurrence of *Microcystis* to *Anabaena*). Thus, if N concentrations increase, the persistence of *Microcystis* blooms could increase even if P concentrations are lowered. In addition, both inorganic and organic N species can be important. Davis et al. (2010) found that growth of the toxic *Microcystis* strains were enhanced by inorganic N whereas the non-toxic strains were stimulated by organic N. Moreover, Zhang et al. (2015) found that microcystin production appeared to be regulated by total N and NO_3^- but not by NO_2^- or NH_4^+. Many phytoplankton species exhibit greater physiological response to N:P than to either N or P separately. Numerous studies have shown that the availability of a combination of N and P often results in higher cyanobacterial biomass than either nutrient added singularly (e.g., Elser et al. 2007; Lewis and Wurtsbaugh 2008; Scott and McCarthy 2010, 2011). With increasing frequency since 2002 there have been reports of algal blooms that are N and P co-limited or N limited, especially during mid-to-late summer. In addition, increased availability of P from both external and internal sources can enhance N limitation, especially under conditions where biological N_2 fixation is not possible.

Model Capability

The model descriptions in the draft Annex 4 ensemble modeling report suggest that, of the eight models used to predict ERIs (not including the *Cladophora* model), only the Ecological Model of Lake Erie (EcoLE), Western Lake Erie Ecosystem Model (WLEEM) and Estuary and Lake Computer Model – Computational Aquatic Ecosystem Dynamics Model (ELCOM-CAEDYM) include state variables for N. None of the models appear to address internal accumulations of N and P by phytoplankton and corresponding N:P ratios, which could be used to explore possible N-loading scenarios.

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Best Management Practices

The Maumee Basin is characterized by extensive row crop agriculture with tile drainage as well as concentrated animal feeding operations. Agricultural Best management practices (BMPs) for P control may help control N but may not be sufficient to attain the level of N control that could be needed. Best management practices for P control often target sediments because much P is particulate. Nitrogen, especially nitrate, is mostly dissolved and much more mobile, so if N removal becomes a goal to be achieved, additional BMPs may be required to increase N removal. The agricultural activity of the Mississippi River Basin leads to the hypoxia in the Gulf of Mexico. Studies of the Mississippi should provide useful BMPs for the Maumee Basin. A recent study indicates that about half of the total N and P in the Mississippi River Basin is contributed by agricultural (about 80% of the agricultural contribution of N comes from fertilizer and 20% comes from manure; and about 55% of the agricultural contribution of P comes from fertilizer and 45% comes from manure) (Alexander et al. 2008; Robertson and Saad 2013). There is some evidence that P loads from agricultural lands in Iowa have declined as a result of the implementation of BMPs (Wang et al. 2016).

In order to evaluate the importance of N control in Lake Erie, research is needed to answer key questions and understand important relationships. These are listed in the key recommendations provided below.

Key Recommendations

<u>Short Term:</u>

- Research should be conducted to determine the total N loadings entering Lake Erie over time and space, including all the major species of N (oxidized, reduced, organic, and particulate). An N budget should be developed for Lake Erie, especially the Western Basin, similar to that for Lake Michigan (Han and Allan 2012).

- Research should be conducted to show the reliability of current models for assessing the role of N in Lake Erie eutrophication and whether the models can be improved (or new models developed) to more completely incorporate N (including internal N and P pools and ratios).

- Research should be conducted to understand the expected response of the four eutrophication response indicators to N reduction in the improved models.

<u>Intermediate Term:</u>

- Research should be conducted to determine: 1) how much of the external N loading can be removed by internal removal processes; 2) the consequences of legacy N and P in the sediments and the differences in internal cycling; and 3) the downstream consequences of not following a dual nutrient strategy.

- Research should be conducted to further understand: 1) the importance of concentrations and ratios of N to other nutrients (P, but also Si) in directing or controlling ecosystem functions; and 2) the balance in the ratio of N to P that would be best for ecosystem functioning.

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- BMPs should be developed and applied to achieve additional N reduction in Lake Erie if needed. Given the difficulty and expense of controlling and reducing N loadings, it is important to optimize ecologically and economically the N sources to be reduced.

- The EPA should determine the reduction in N loading that results from reduction of P loading.

Long Term:

- Lessons learned from case studies of nutrient reduction in the Baltic Sea and other areas should be applied to Lake Erie. This should include scientific, technical, policy and governance strategies.

3.4. Evaluation of Nutrient Reduction Targets

Inter-annual loading trends for the Maumee River are greatly influenced by annual variability in flows (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015). The Task Team identified a maximum flow below which the target load should be met and recommended the use of flow-weighted mean concentrations (FWMC) as a benchmark for any given tributary load. The SAB was asked to comment on the use of FWMC and any other approaches that should be considered to account for inter-annual variability in hydrology in assessing progress in reducing tributary loadings of P.

The Task Team also recommended development of a comprehensive adaptive management program that would include annual routine monitoring of appropriate load, FWMCs and in-lake nutrient eutrophication response indicators in conjunction with an intensive monitoring, research and operational model application program every five years. The SAB was asked to comment on the adaptive management approach.

3.4.1. Assessing Progress in Reducing Tributary Loadings of Phosphorus

> *Charge Question 5. Please comment on the use of FWMC and any other approaches that should be considered to account for inter-annual variability in hydrology in assessing progress in reducing tributary loadings of phosphorus to the Lake.*

In a stratified sampling program typically used in loading studies (e.g., Heidelberg University's monitoring of Ohio tributaries), each sample does not have equal weight in determining the average. Some samples may represent time intervals of one or more days, while others represent intervals of only a few hours. Some form of sample weighting must be used to properly average tributary data collected at such varying frequencies. In river systems, two types of mean concentrations can be considered: a time-weighted mean concentration and a flow-weighted mean concentration (FWMC). The FWMC is the preferred approach for calculating average concentrations in tributaries with variable flows. For example, FWMC can be used to represent the average TP concentration in water discharged from the Sandusky River to Sandusky Bay. To determine FWMC, the concentration in each sample is weighted by both the accompanying time interval and the flow. FWMC represents the total load for the time period (e.g., annually or March-July) divided by the total discharge for the same time period.

Flow Weighted Mean Concentrations are recognized as useful measures to address inter-annual variability because they normalize the tributary P loading/delivery with respect to flow so that year-to-

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year performance (referring to nonpoint source nutrient controls) is not confounded by inter-annual hydrology (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015). The Task Team recommended using tributary FWMC as a benchmark to track progress in load reduction. The SAB recommends reviewing all available monitoring outputs (e.g., discharge, flow, concentrations, loads) from significant tributaries and multiple assessment approaches (including FWMC and flow-adjusted concentrations) to evaluate efforts to control nutrient loadings. In addition, uncertainty in the values derived using the flow-weighted or flow-adjusted approaches should be explicitly quantified and presented, and detailed information on the implementation of P reduction strategies should be collected to help identify the reasons for changes in P loads delivered to the Lake.

The use of FWMC analyses alone may "mask" elevated concentrations that could result in algal blooms. Any analysis of the effect of nutrient concentrations should consider the response of the organisms intended to be controlled. Nutrient concentrations (as affected by nutrient loadings) control organism responses and the effect of temporal variability is an important consideration, especially for organisms that have rapid life cycles and may respond quickly to shifts in nutrients.

The Heidelberg Tributary Loading Program (Heidelberg University 2016) collects and analyzes approximately 450-500 water samples for pollutants at its monitoring stations each year. From that information it calculates annual pollutant loads from each station and the loads of nutrients, sediments and pesticides delivered to Lake Erie or the Ohio River. The Program makes the tributary data for most of the monitoring stations publicly available, and also distributes a spreadsheet for data analysis that calculates FWMC along with loadings for the nutrient parameters (TP, SRP, $NO_2^- + NO_3^-$, Total Kjeldahl N or TKN) measured. Therefore, FWMC is a readily available statistic. For pollutants that tend to increase in concentration as flow increases (like TP in the Maumee River), the FWMC will be greater than the time-weighted mean concentration.

FWMC is considered by the Task Team to be a key tool for nonpoint nutrient control efforts (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015). FWMC has intuitive appeal because it is a concentration, which may be easier to understand and communicate than "mass loading." FWMC is also useful for developing tributary inputs appropriate for the advanced process-based models (WLEEM and ELCOM- CAEDYM) that require specification of both flow and nutrient concentration in each tributary, instead of the tributary or basin-aggregate mass loadings used by the simpler P mass balance models. An example showing how the FWMC approach can be implemented is presented by Sether et al. (2004). The authors used this method to compare annual load estimates of multiple water quality constituents across several sub-basins, accounting for differences in average annual stream flow. Sether et al. (2004) also demonstrated an approach for calculating confidence limits for FWMC estimates, explicitly acknowledging the uncertainty of these estimates and recognizing that this uncertainty can influence how the results are interpreted in a management context. The SAB notes that FWMC estimates for Lake Erie also should be accompanied by an appropriate quantitative estimate of their uncertainty.

Annual discharge from the Maumee River is highly variable due to variations in the intensity, amount and timing of precipitation. This variability is also an important factor leading to yearly differences in P loads. Similarly, discharge from spring to early summer (March-July) varies annually, and inter-annual variability during this period has been associated with variations in the size of the summer cyanobacteria bloom (Stumpf et al. 2012; Obenour et al. 2014); therefore, tributary loadings during this "critical period" merit particular attention. The Task Team has attempted to account for this confounding

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behavior by identifying a maximum flow below which the target load should be met and by recommending the use of FWMCs to track progress for any given tributary target load. Examination of Figures 9 (Maumee River discharge), 10 (TP FWMC and load) and 11 (SRP FWMC and load) in *Recommended Phosphorus Loading Targets for Lake Erie* (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015) suggests that similar trends are evident in FWMC and loading, especially for 5-year running averages. It appears that appropriate filtering (e.g., 5-year running average) is also a necessary component of assessing trends in Maumee River discharges, concentrations and loads. Although the Task Team's use of FWMC has focused on the Maumee River, the calculation should be considered for other Lake Erie tributaries that are monitored using stratified sampling programs.

The SAB notes that FWMCs are distinct from flow-adjusted concentrations (FACs), another tool that should be considered in assessing progress in reducing tributary loadings of P. FACs are the residuals from a statistical model relating concentration to discharge flow. FACs are used to remove the seasonality from tributary monitoring data, and for detecting annual trends in the data once seasonality is removed. For example, flow-adjusted concentrations were demonstrated by Stow and Borsuk (2003) to aid in assessment of nutrient TMDL implementation on the Neuse River. Helsel and Hirsch (2002) also provide information on the flow-adjusted concentration method.

Stow et al. (2015) note that Maumee River discharge increased from 1984-2013, a pattern that has been shown to be consistent with long-term precipitation increases. In order for FWMC to offer an accurate assessment of progress in reducing tributary loadings of P to Lake Erie, the assessment must also consider the long-term trends in precipitation and discharge, and the FWMC benchmarks must be adjusted as necessary to compensate for such trends affecting nutrient loadings. Discussion by Stow et al. (2015) is particularly relevant regarding the use of FWMC or other approaches that should be considered to account for inter-annual variability in hydrology:

> "While it is generally acknowledged that targets may be exceeded during years of unusually high precipitation and tributary discharge, the use of load targets remains a common management tool. However, Milly et al. (2008) highlighted the growing recognition that, for variables such as tributary discharge, the assumption of stationarity, in an era of uncertain climate change, poses management challenges. Our results, indicating progressive precipitation and discharge increases in the Maumee River basin and concurrent phosphorus input increases to Lake Erie, suggest that imposing fixed load targets may require phosphorus concentrations to be persistently lowered to compensate for increasing discharge, if the targets are to be achieved. As phosphorus load targets are re-evaluated pursuant to the updated 2012 GLWQA, it may be appropriate to address the possibility that continued discharge increases into the future may affect target attainment even if phosphorus reduction strategies are successful."

This statement highlights the need for future collection of detailed information on the implementation of P reduction strategies in each major watershed.[7] Without this information, it will not be possible to adequately identify the primary reasons for the observed changes (or lack thereof) in P loads delivered to

[7] The Task Team identified a number of priority watersheds (Great Lakes Water Quality Agreement Annex 4 Objectives and Targets Task Team 2015).

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Lake Erie. This will limit the ability to adequately assess the effect of P reduction strategies in light of other confounding factors such as those related to climate change.

The SAB also notes that, as previously discussed, P may not be the only factor affecting algal growth in Lake Erie; N, silica or other micronutrients may also affect algal growth. If the focus of the Task Team expands to consider the control of other nutrients, the same assessment approaches should be applied to tributary monitoring data for those nutrients to evaluate efforts to control sources of nutrient loadings.

Key Recommendations

Short Term:

- Uncertainty in the values derived using the flow-weighted or flow-adjusted assessment approaches should be explicitly quantified and presented, and detailed information on the implementation of P reduction strategies should be collected to help identify the reasons for observed changes in P loads delivered to Lake Erie.

Intermediate Term:

- All available monitoring data from significant tributaries and multiple assessment approaches should be reviewed to evaluate efforts to control sources of nutrient loadings. The evaluation should include relationships between hydrology, climate, agricultural practices, source control and trends in nutrient loads and concentrations.

3.4.2. Adaptive Management Program

> *Charge Question 6. Please comment on the value of applying the existing eutrophication models on an ongoing basis to periodically evaluate phosphorus loading targets and eutrophication response indicators. What key elements should be included in the adaptive management approach to successfully implement and evaluate our nutrient reduction goals for Lake Erie?*

The SAB strongly endorses the development of an adaptive management program to evaluate the responses of eutrophication indicators in relation to nutrient reductions consistent with the goals developed for Lake Erie. The adaptive management program should involve an ongoing evaluation of the efficacy of loading reductions in achieving the desired responses of the eutrophication indicators and the adjustment of management actions, monitoring, and modeling in light of new information. This is particularly important given uncertainties in the present P-reduction targets with respect to the expected response indicator outcomes, as well as the potential for changing future conditions. An important component of adaptive management is the opportunity to identify alternative management actions if reductions in loadings fail to produce the desired or anticipated outcomes. The SAB provides the following recommendations for adaptive management.

1. A standing adaptive management committee should be appointed. The SAB recommends that the EPA formally appoint a standing adaptive management committee that is supported over the long-term. The committee should include technical experts (both academic and agency scientists) and be charged with coordinating ongoing modeling and monitoring to evaluate progress towards meeting loading targets and the desired values of the ERIs. The committee should consider alternative

management actions and develop the necessary supporting science if reductions in nutrient loading fail to achieve the desired outcomes as measured by the ERIs. Through this process, adaptive management can usefully inform future management decisions.

2. A coordinated binational long-term monitoring strategy should be developed. It is critical to provide support for stabilizing and enhancing long-term monitoring in order to assess whether loading and ERI targets are being met. Consideration should be given to the following activities:

   - Assessing available loading information and developing standardized protocols for loading estimates, including correlation between P loadings from major tributaries (estimated from hydrologic loads and FWMC of total P and bioavailable P) and ERIs;
   - Maintaining current tributary monitoring capabilities (e.g., Heidelberg University) and adding additional tributaries;
   - Developing standardized protocols for monitoring, evaluating and reporting values of ERIs (cyanobacteria; hypoxia; *Cladophora*) in relation to management objectives;
   - Considering the potential for additional ERIs (i.e., chlorophyll a, biological endpoints such as benthic organisms in hypoxic areas and general fish productivity; measuring the health and diversity of fish communities, particularly Whitefish, *Coregonus clupeiformis*);
   - Ensuring that measurements are made of those variables that are necessary for calibrating and assessing the performance of models and for evaluating alternative management actions as necessary (see recommendations below).
   - Ensuring that measurements are being made of those variables that are necessary for development of new or improved models (i.e., mechanistic models of sediment diagenesis, nutrient flux, and sediment oxygen demand);
   - Incorporating measurements that provide "early warning" for climate change impacts.

3. Recommended models should be used as part of the adaptive management process. As previously indicated, it may not be necessary to run all of the models that were included in the ensemble modeling effort. However, the SAB finds that models can be used as part of the adaptive management process to both identify and evaluate alternative management actions. They can also be used to identify data gaps and to run future scenarios. In particular, the SAB recommends that:

   - Models be used to make annual predictions of ERIs (cyanobacteria, hypoxia and *Cladophora*) and post-audits be conducted to evaluate these projections;
   - Models be refined based on changing loadings and other new data;
   - Estimates of uncertainty be improved in the models;
   - Lake models be linked to upstream source functions via watershed models;
   - Cases where models do not perform well be used to develop alternative hypotheses;
   - Models be built into alternative hypotheses as appropriate.

4. Alternative management actions may be required. The attempt to manage eutrophication in the Western Basin of Lake Erie by reducing external P loading by 40 percent is based on the assumptions that: (1) external P-loading is the sole driver, or at least the overwhelmingly major driver, of HABs, hypoxia, and *Cladophora* proliferation, and (2) reduction in external P loading will result in a reduction of these responses. It should be recognized that nutrient reduction is a management action that can be evaluated within an adaptive management program. Depending on

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the success of nutrient reduction in achieving the desired values of the ERIs, additional factors beyond reducing external P loading might need to be identified and incorporated into the management strategy.

An important task for the adaptive management committee is to propose alternative drivers for the ERI's and to assess what monitoring/modeling/experiments could be conducted to most effectively distinguish among them. This can be done using a more passive approach wherein hypotheses are modified and tested iteratively by adjusting design operations (sometimes called "monitor and modify") or by taking a more active approach such as setting up field manipulations to test competing hypotheses. It is beyond the scope of this SAB report to develop a comprehensive list of alternative hypotheses for Lake Erie eutrophication. However, the SAB suggests the following list of issues that might be considered, along with the accompanying research, monitoring and modeling tasks that would be useful for addressing each issue. The SAB offers these as a starting point for further consideration and prioritization by the adaptive management committee. As part of this process, it would be instructive for the adaptive management committee to consider what the potential management response might be if a given alternative is found to be important.

Loading

It is not clear how effective BMPs applied at different times and places in the watershed will be for reducing P, nor is it understood whether BMPs directed at P-retention will be effective for N removal.

Research, monitoring and modeling:

- Characterize BMPs with respect to the geochemical form of nutrient runoff addressed, spatial distribution, type of BMP and life cycle effectiveness.
- Compare N runoff in areas using different BMPs targeted at P control.
- Conduct small-scale experiments that quantify the efficiency of BMPs for reducing both P and N.
- Link watershed models to in-lake models and run a suite of scenarios to evaluate the effectiveness of using different combinations of BMPs over space and time.

Cyanobacteria

The timing and magnitude of cyanobacterial blooms may be affected by the stoichiometric balance of N and P in resource supply because algal growth and nutrient demand can generate conditions where N and P become co-limiting. In addition, it is important to understand the linkage between cyanobacterial biomass and toxin production in order to effectively address the potential effects of blooms.

Research, monitoring and modeling:

- Calculate N loading to compare with P (including N:P ratios) and bioavailable forms of N and P.
- Monitor key N constituents in the tributaries.
- Run N scenarios in models; potentially develop new models.
- Evaluate the seasonal timing of N loading.
- Consider conducting *in situ* experiments (limno-corrals) to evaluate N limitation in the field.

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- Measure toxins in a standardized, coordinated way.
- Evaluate correlations between particulate organic carbon (POC), chlorophyll a, cyanobacteria and microcystin concentration.
- Develop models to explore relationships between P, N, phytoplankton community composition and implications for toxins.

Hypoxia

A number of factors contribute to the potential for oxygen depletion and hypoxia in the Lake, including the duration and magnitude of spring diatom blooms, the seasonal progression of stratification, and the extent of sediment oxygen demand. Although many of these factors are incorporated in current models, it would be useful to improve our understanding of the relative importance of these drivers and their relationship to external nutrient loads.

Research, monitoring and modeling:
- Quantify diatom bloom magnitude and duration.
- Evaluate relationship between diatoms and seasonal N, P and silicon (Si) loading.
- Use models and empirical analyses to evaluate relationship between diatoms and hypoxia.
- Run model scenarios with varying stratification for a given P load.
- Expand models to include mechanistic processes to represent sediment nutrient diagenesis and fluxes of inorganic nutrients and sediment oxygen demand.
- Collect site-specific data to support the development and calibration of models of nutrient diagenesis and fluxes of inorganic nutrients and sediment oxygen demand.

Cladophora

Cladophora standing crop and productivity may be linked to internal P release from hypoxic sediments or near-shore sources of P. In addition, the role of dreissenid mussels in promoting *Cladophor*a proliferation is unclear.

Research, monitoring and modeling:
- Monitor near-surface suspended sediment concentrations to characterize the upper active mixed layer in the Western Basin.
- Improve on current *Cladophora* modeling to include nearshore processes.
- Monitor dreissenid populations in the Central and Eastern Basins
- Compare light levels, N and P release in dreissenid beds (with and without *Cladophora* removed) and control areas.

5. Future scenarios should be evaluated. Part of the reason that the loading targets for P are being re-evaluated is because of the changing response of the Lake over the past few decades. As part of the adaptive management process, it will be important to understand the effects of climate variability and other factors that may change in the future (Smith et al. 2015). The SAB recommends that the adaptive management committee: (a) evaluate recent trends in the relationships between loading and ERIs for evidence of increasing sensitivity or changes in seasonality (e.g., March-July) or spatial patterns, and (b) develop a suite of future scenarios that can be explored using models.

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Potential scenarios that could be evaluated include:

- Climate change: increased precipitation and discharge; increased temperature; shorter duration of ice cover.
- Anticipated changes in land use and population density.
- Regional economic development.
- Zero P input: (i.e., with no additional load, how long will it take for internal stores of P to run out?). This is not so much an anticipated future scenario as a way to establish an end member.
- Combinations of the above that use integrated modeling approaches (e.g., combining watershed landscape and hydrology models with Lake models).

6. The work proposed here should be structured to provide answers to the following questions on an ongoing basis:

- Are load reduction targets being met?
- Are ERI's responding?
- Are ERI's being predicted accurately? If not, what alternative factors need to be considered?
- Are there additional management measures that need to be considered based on additional understanding gained from evaluating alternative hypotheses?
- Which environmental and land use conditions are changing or likely to change in the future? If so, what implications would such changes have for management?

In order to be in a position to address these questions the SAB recommends that the adaptive management committee meet regularly and establish concrete targets for identifying key variables to be monitored; deciding which alternative hypotheses are most important and what models/data are needed to evaluate them; and agreeing on forecasting scenarios. This requires a long-term institutional commitment to the process at the local and regional levels.

Key Recommendations

<u>Short Term:</u>

- A standing adaptive management committee should be appointed to develop a program that investigates alternative hypotheses and long-term forecasts in order to inform future management decisions.

- A coordinated binational long-term monitoring strategy should be developed. A standardized monitoring protocol should be implemented among the different groups involved. The same assessment approaches should be applied to tributary monitoring data for N and P to evaluate efforts to control sources of nutrient loadings.

- Alternative management actions for Lake Erie eutrophication should be identified and evaluated if loading reductions fail to produce the desired management objectives.

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- Recommended models should be used as part of the adaptive management process to identify and evaluate alternative hypotheses. The models can also be used to identify data gaps and to run future scenarios.

- Future scenarios should be evaluated to understand the effects of climate variability and other factors that may change in the future.

- The proposed work should be structured to provide answers to key questions (e.g., are load reduction targets being met, are ERIs responding, are ERIs being predicted accurately) on an ongoing basis.

- The effectiveness of BMPs should be characterized with respect to type, spatial location in the watershed, and life cycle effectiveness.

Intermediate Term:

- Detailed information on the implementation of P reduction strategies in each major watershed should be collected into the future (e.g., the areas of the landscape where strategies are being implemented and P monitoring data showing trends in those areas).

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APPENDIX A: THE EPA'S CHARGE QUESTIONS

Background

EPA Region 5 is co-leading a binational workgroup to develop and implement the Nutrients Annex ("Annex 4") of the 2012 Great Lakes Water Quality Agreement (GLWQA) in accordance with Article 3(b)(i) of the GLWQA. Under Annex 4, the U.S. and Canada committed to address eutrophication issues in Lake Erie by first establishing phosphorus objectives, loading targets and allocations for the nearshore and offshore waters by February 2016, and subsequently develop phosphorus reduction strategies and domestic action plans by 2018. A binational workgroup of Lake Erie scientists used a suite of models to generate a series of load response curves in order to simulate the impact of phosphorus loads to cyanobacteria biomass, hypoxia and *Cladophora* growth, and identify the phosphorus reductions needed to meet the desired ecological condition for the Lake. EPA sought early SAB advice on the modeling approach in December 2014. The SAB's feedback was considered in the subsequent deliberations by the binational workgroup, and resulted in improved documentation of the uncertainties and sensitivities of the models. The U.S. and Canada released the recommended binational phosphorus reduction targets in June 2015 and sought public input during July and August. The phosphorus load reduction targets were accepted by the U.S. and Canada on February 22, 2016, as follows:

> *To minimize the extent of hypoxic zones in the waters of the central basin of Lake Erie: a 40 percent reduction from 2008 loads in total phosphorus entering the western basin and central basin of Lake Erie – from the United States and from Canada – to achieve a 6,000 metric ton central basin load. This amounts to a reduction from the United States and Canada of 3,316 metric tons and 212 metric tons, respectively.*
>
> *To maintain algal species consistent with healthy aquatic ecosystems in the nearshore waters of the western and central basins of Lake Erie: a 40% percent reduction in spring total and soluble reactive phosphorus loads from the following watersheds where localized algae is a problem: in Canada, the Thames River and Leamington tributaries; and in the U.S., the Maumee River, the River Raisin, the Portage River, Toussaint Creek, the Sandusky River, and the Huron River, OH.*
>
> *To maintain cyanobacteria biomass at levels that do not produce concentrations of toxins that pose a threat to human or ecosystem health in the waters of the western basin of Lake Erie: a 40 percent reduction in spring total and soluble reactive phosphorus loads from the Maumee River in the U.S.*

Further reductions in phosphorus may be necessary to address benthic nuisance algal growth and shoreline impacts in Lake Erie's eastern basin. The Annex 4 Objectives and Targets Task Team will meet later this year to reconsider the viability of developing a target for the eastern basin, given the current state of the science on *Cladophora* and recent updates to the *Cladophora* growth model.

EPA is currently working with other federal, state and Canadian partners to develop a long-term plan that will identify the monitoring, data and analyses needed to support implementation and evaluation of these nutrient reduction goals as part of an ongoing, adaptive management approach. We are also

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working to develop a binational phosphorus reduction strategy and domestic action plans which will outline actions to be taken to achieve the targets.

Furthermore, a binational task team was formed under Annex 4 to initiate steps required to develop Lake Ontario nutrient targets. That team is currently assessing the status of nutrients and eutrophication impacts in Lake Ontario, identifying gaps in monitoring and modeling needed to support targets development. The Lake Ontario Nutrients Task Team will benefit from lessons learned and consideration of modeling approaches in Lake Erie.

Charge to SAB:

The EPA requests Science Advisory Board (SAB) review of the current modeling results and other information used to inform development of the binational phosphorus reduction targets. We are seeking a critical review so that we can ensure the Agency's ongoing efforts to develop, implement and evaluate nutrient reduction goals for Lake Erie are based on sound scientific data, analyses, and interpretations. In a spirit of adaptive management, we are most interested in SAB advice on enhancements to the modeling approach, or new approaches to consider, that will help us proactively manage eutrophication issues in Lake Erie in the long term.

Review Documents: The panel will review the following documents, which taken together explain the process followed to develop the binational phosphorus loading targets for Lake Erie:

- The Annex 4 Ensemble Modeling Report and Appendix B
- *Recommended Phosphorus Loading Targets for Lake Erie: Annex 4 Objectives and Targets Task Team Final Report to the Nutrients Annex Subcommittee. May 11, 2015*

Additional Documents: The following documents (and associated references), provide important context and information related to our current efforts:

- A Multi-Model approach to evaluating target phosphorus loads for Lake Erie. Scavia, DePinto and Bertani. *Journal of Great Lakes Research*, in press.
- *State of Knowledge of Cladophora in the Great Lakes. Executive Summary of Workshop held at NOAA-Great Lakes Environmental Research Laboratory January 26-28, 2016*

Charge Questions:

Approach for Developing Lake Erie Phosphorus Load Reduction Targets

Nine different Lake Erie models were used to predict the response of selected eutrophication response indicators to different phosphorus load scenarios (see Table 1 in the Annex 4 Ensemble Modeling Report). The eutrophication response indicators evaluated were (1) overall phytoplankton biomass represented by chlorophyll a, (2) cyanobacteria blooms in the Western Basin, (3) hypoxia in the hypolimnion of the Central Basin, and (4) *Cladophora* in the nearshore areas of the Eastern Basin. Technical evaluation criteria were used to assess the capabilities of each model (see Section 2.3 and Appendix B of the Annex 4 Ensemble Modeling Report) and load-response curves were generated for each eutrophication response indicator (see Section 3 and Appendix B of the Annex 4 Ensemble Modeling Report).

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1. Please comment on whether the evaluation of the models was adequate to inform how model results should be interpreted, given differences in model complexity and scale. Please identify any additional analyses that may be needed to improve future development and interpretation of the load-response curves for the eutrophication response indicators.

The document, R*ecommended Phosphorus Loading Targets for Lake Erie* describes the process followed by the Annex 4 Objectives and Targets Task Team to develop phosphorus loading targets for Lake Erie. The document indicates that, to achieve a Western Basin cyanobacteria bloom biomass threshold no greater than that observed in 2004 or 2012, 90% of the time, a spring Maumee River load of 860 metric tons of total phosphorus and 186 metric tons of dissolved reactive phosphorus is recommended. In addition, a 40% reduction in the spring load of total phosphorus and dissolved reactive phosphorus from other Western Basin tributaries and the Thames River is recommended. To meet a threshold of 2.0 mg/L or higher of hypolimnetic dissolved oxygen, an annual total phosphorus load of 6,000 metric tons to the Western and Central Basins is recommended. The Task Team did not recommend new phosphorus concentration objectives for the open waters or the nearshore be identified at this time.

2. Please comment on whether the recommended targets reflect the best available information on the drivers of cyanobacteria growth and seasonal hypoxia in Lake Erie and are appropriate to meet the nutrient Lake Ecosystem Objectives defined in the GLWQA (as reflected in Table 1 on page 7 of the document titled *Recommended Phosphorus Loading Targets for Lake Erie*).

Cladophora Growth

Additional phosphorus load reductions may be necessary to reduce nuisance levels of *Cladophora* in the nearshore waters of the Eastern Basin of Lake Erie. The Annex 4 Objectives and Targets Task team did not recommend a specific phosphorus objective or loading target to address *Cladophor*a growth. EPA and Environment and Climate Change Canada convened a workshop in January 2016 to assess the current state of knowledge of *Cladophora* growth in the Great Lakes and identify potential options for nutrient target development to be considered by the Annex 4 subcommittee. (Please see the background document titled "State of the Knowledge of *Cladophora* in the Great Lakes. Executive summary of Workshop held at NOAA-Great Lakes Environmental Research laboratory, January 26-28, 2016.")

3. Please comment on whether scientifically-sound phosphorus load reduction recommendations to address *Cladophora* growth in the Eastern Basin of Lake Erie could be developed at this time.

Nitrogen Control

While the current strategy focuses on limiting phosphorus loading to the Lake (total and dissolved forms) as the key mechanism for controlling excessive algal growth, it is implied or assumed that nitrogen loading likely will also be reduced through implementation of agricultural best management practices, and the Task Team recommended that tributary nitrogen loads to the Lake be tracked in addition to phosphorus.

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4. What recommendations can the SAB provide for development of an approach to help determine whether consideration of nitrogen control, in addition to phosphorus, is warranted in Lake Erie to prevent harmful algal blooms and manage hypoxia? In particular, what questions, relationships, or research priorities related to nitrogen loading (different forms and sources) and in-lake cycling must be addressed?

Evaluation of Nutrient Reduction Targets

The inter-annual loading trends for the Maumee River are greatly influenced by annual variability in flows. The Objectives and Targets Task Team identified a maximum flow below which the target load should be met and recommended the use of flow-weighted mean concentrations (FWMC) as a benchmark for any given tributary target load.

5. Please comment on the use of FWMC and any other approaches that should be considered to account for inter-annual variability in hydrology in assessing progress in reducing tributary loadings of phosphorus to the Lake.

The Task Team recommended development of a comprehensive adaptive management program that would include annual routine monitoring of appropriate load, FWMC, and in-lake nutrient-eutrophication response indicators in conjunction with an intensive monitoring, research, and operational model application program every five years.

6. Please comment on the value of applying the existing eutrophication models on an ongoing basis to periodically evaluate phosphorus loading targets and eutrophication response indicators. What key elements should be included in the adaptive management approach to successfully implement and evaluate our nutrient reduction goals for Lake Erie?

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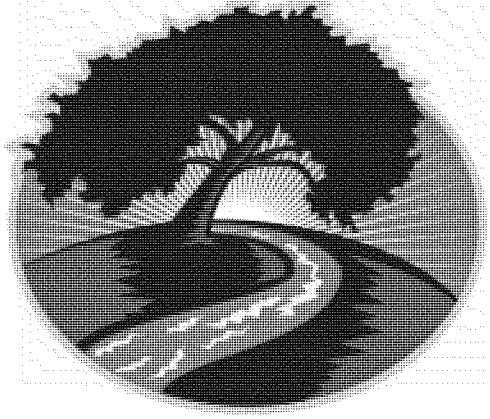
Southeastern Pennsylvania Nutrient Coalition



June 6, 2017

VIA EMAIL & FIRST CLASS U.S. MAIL

Mr. E. Scott Pruitt
Administrator
U.S. Environmental Protection Agency Headquarters
William Jefferson Clinton Building
1200 Pennsylvania Avenue, N.W. – Mail Code 1101A
Washington, DC 20460

RE: Request for Peer Review of EPA Region 3's TMDL Nutrient Endpoint Report

Dear Administrator Pruitt:

On behalf of the Southeastern Pennsylvania Nutrient Coalition of boroughs, townships, and wastewater treatment authorities (including Telford Borough, Telford Borough Authority, Lower Salford Township Authority, Lower Salford Township, Souderton Borough, Franconia Township, Franconia Sewer Authority, Abington Township, Newtown Township, Hatfield Township and Westchester), we request a meeting to discuss EPA Headquarters' coordination of an independent peer review of a document entitled *Development of Nutrient Endpoints for the Northern Piedmont Ecoregion of Pennsylvania: TMDL Application – Follow-Up Analysis* ("TMDL nutrient endpoint report"). *See attached* Ex. 1. As outlined below, we believe this EPA document creating stringent nutrient reduction requirements for Eastern PA waters is not scientifically defensible and single-handedly misallocates hundreds of millions of dollars in municipal funds towards unnecessary construction of wastewater and stormwater facilities. As noted in *Presidential Executive Order on Promoting Energy Independence and Economic Growth*, these are precisely the type of regulatory decisions that should be peer-reviewed:

> It is also the policy of the United States that necessary and appropriate environmental regulations comply with the law, are of greater benefit than cost, when permissible, achieve environmental improvements for the American people, *and are developed through transparent processes that employ the best available peer-reviewed science and economics.*

(signed March 28, 2017) (emphasis added). As conscientious stewards of the environment, we remain fully committed to water standard compliance and dedicating our limited resources towards expenditures that will achieve this goal. However, we have serious concerns that this document, and the exorbitant costs that it will impose by its use, will achieve such ends. Therefore, we believe that a thorough independent review of the document should be conducted.

Background

The TMDL nutrient endpoint report was originally developed in 2007 by TetraTech for EPA Region 3. The 2007 report was subsequently updated by TetraTech in 2012 to address comments made by the EPA Science Advisory Board (SAB, 2010) critical of the stressor-response evaluations contained in the original report. *See* Ex. 2, EPA's 2010 Peer Review Report. Despite a harsh rebuke from the SAB that undercut the central presumption underlying the TMDL nutrient endpoint report, EPA and TetraTech concluded in the follow-up report that the 40 µg/l total phosphorus ("TP") stream endpoint target developed in the 2007 report is still scientifically defensible and will ensure compliance with Pennsylvania's narrative criteria for nutrients (*e.g.*, protection of aquatic life). Once developed, these reports served as the linchpin determination to impose the same 40 µg/l TP stream endpoint target in nutrient TMDLs for several southeastern Pennsylvania free flowing streams (*e.g.,* Indian Creek, Goose Creek, Wissahickon Creek, Southampton Creek). Many of these TMDLs have been heavily contested and/or are currently being litigated in Federal Court. *See, e.g., Telford Borough Authority v. EPA*, (E.D.P.A. 12-6548); *West Goshen Sewer Authority v. EPA*, (E.D.P.A. 12-5353).

Major Scientific Flaws

While each of the entities in our group have site-specific concerns with application of the 40 µg/l TP target in their watershed, the following major technical flaws apply generally to all watersheds:

- Available data for these watersheds confirm that high levels of plant growth (periphyton) are occurring independent of TP concentrations (*i.e.,* no relationship between the two parameters). Accordingly, even if hundreds of millions of dollars are spent in an effort to meet the 40 µg/l TP target, there will be no resulting benefit to the aquatic ecosystems of these watersheds.

- Contrary to the nonexistent relationship between TP and periphyton in the available data, there is a strong relationship between periphyton growth and canopy cover. *See* Ex. 3, PADEP Memorandum by Alan Everett on Periphyton Standing Crop in Wissahickon Watershed. The data confirm that increasing canopy and restoring the riparian zone would be far more effective – not to mention cost-effective – in reducing plant growth.[1]

- Numerous scientific studies – even some developed by EPA's experts – confirm that periphyton control via TP reduction is virtually impossible, except at extremely low levels of TP that are not attainable in these watersheds (less than 10 µg/l TP). *See* Ex. 4, Dodds Report (at 677).

[1] On multiple occasions, our group has requested to implement a stream restoration proposal in lieu of the TMDL reductions. EPA Region III has denied each of these proposals.

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- The majority of southeastern Pennsylvania streams are heavily populated and urbanized. Accordingly, the upstream background concentrations of TP are elevated well beyond the 40 µg/l target and would make compliance with that endpoint infeasible – even if phosphorus was entirely eliminated from the wastewater and stormwater discharges. It is inappropriate to regulate in a manner that causes enormous energy and financial costs with no benefit. *See Michigan v. EPA*, 135 S. Ct. 2699, 2707 (2015) ("No regulation is 'appropriate' if it does significantly more harm than good.").

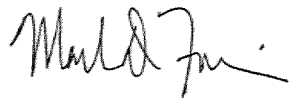
- The TMDL nutrient endpoint report is directly at odds with an earlier SAB review finding that such generalized analyses for developing nutrient endpoints are not scientifically defensible. *See* Ex. 2, SAB Peer Review Report, at 38 ("Numeric nutrient criteria developed and implemented without consideration of system specific conditions (e.g., from a classification based on site types) can lead to management actions that may have negative social and economic and unintended environmental consequences without additional environmental protection.")

Peer Review Request

As noted in the recent executive order, it is crucial that our federal regulatory programs be based on sound decision-making and good science – not guesswork or generalized one-size-fits-all approaches that misdirect limited resources to unnecessary or unhelpful measures. This is particularly true in the realm of nutrients, where EPA has been seeking to regulate nutrients at all times and all places, regardless of what the data show or the ability to actually control the situation. *See, e.g.,* Ex. 5, SAB's Draft Peer Review of TP limits in Lake Erie to regulate Cladophora.

As several hundred million dollars in wastewater and stormwater compliance costs could easily be triggered by this one report, we believe that a second peer review, to supplement the 2010 SAB review, would be a reasonable and prudent means to ensure that our resources are being appropriately expended. We look forward to meeting with you and further discussing this request.

Sincerely,



Mark D. Fournier
on behalf of the Southeast Pennsylvania
Nutrient Coalition

Enclosures
cc: Sarah Rees, USEPA
Sarah A. Greenwalt, USEPA
Troy Lyons, USEPA

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Justin Schwab, Esq., USEPA
Donald Benton, USEPA
Senator Pat Toomey
Senator Bob Casey
Congressman Ryan Costello
Congressman Pat Meehan
Congressman Bill Shuster
Congressman Brian Fitzpatrick
Congressman Brendan Boyle

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Southeastern Pennsylvania Nutrient Coalition

June 6, 2017

VIA EMAIL & FIRST CLASS U.S. MAIL

Senator Pat Toomey
Senator Bob Casey
Congressman Ryan Costello
Congressman Pat Meehan
Congressman Bill Shuster
Congressman Brian Fitzpatrick
Congressman Brendan Boyle

RE: Request for Congressional Support for Peer Review of EPA Region 3's Nutrient Endpoint Report

Dear Senators and Congressmen:

On behalf of the Southeastern Pennsylvania Nutrient Coalition (including Telford Borough, Telford Borough Authority, Lower Salford Township Authority, Lower Salford Township, Souderton Borough, Franconia Township, Franconia Sewer Authority, Abington Township, Newtown Township, Hatfield Township and Westchester), we are seeking support of our Coalition's request to have EPA conduct an independent peer review of a nutrient endpoint report that EPA is using to impose stringent nutrient reduction mandates throughout eastern Pennsylvania. *See,* Peer Review Request. As discussed in the Coalition's peer review request, this document is single-handedly misallocating hundreds of millions of dollars of municipal expenditures throughout southeastern Pennsylvania. We are asking your help to avoid this waste of limited state resources.

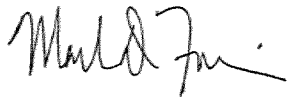
While our communities are more than willing to pay for watershed improvement efforts that will produce meaningful environmental benefits where mandated by state or federal law, our reviews have determined that (1) the nutrient reductions driven by this document will be meaningless in improving the conditions in our local streams/creeks, and (2) less costly canopy restoration is the only way to eliminate the excess periphyton growth. Unfortunately, despite numerous requests based on these findings, EPA has been unwilling to withdraw its nutrient reduction mandates that are based on this nutrient endpoint report.

Accordingly, the requested peer review is the only way – aside from litigation – that the Agency will modify its position. For instance, in 2009, a similar Pennsylvania Congressionally-supported peer review request triggered an independent peer review by EPA's Science Advisory Board. That action proved to be instrumental in getting the Agency to withdraw/revise a

similarly flawed nutrient guidance document, following the Science Advisory Board's conclusion that EPA's approach was not scientifically defensible. While we anticipate a similar result if an independent peer review were to be granted for this document, we are, nonetheless, willing to live with the results of an independent review, regardless of the outcome.

Therefore, we respectfully request your offices support for this peer review request. Thank you for any assistance you can provide that will assure Pennsylvania's resources are wisely expended.

Sincerely,



Mark D. Fournier
on behalf of the Southeast Pennsylvania
Nutrient Coalition

Enclosure

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To: Jackson, Ryan[jackson.ryan@epa.gov]
From: Ryan Jackson
Sent: Mon 7/10/2017 9:59:11 AM
2017-g20-climate-and-energy-en.pdf

https://www.g20.org/Content/DE/_Anlagen/G7_G20/2017-g20-climate-and-energy-en.pdf?__blob=publicationFile&v=4

Ryan Jackson
Ex. 6 - Personal Privacy

G20 GERMANY 2017

G20 Hamburg Climate and Energy Action Plan for Growth

...

A. Preamble[1]

Economic growth, sustainable development and prosperity are at the heart of G20 cooperation. They rely on universal access to affordable, reliable , sustainable energy sources and clean technologies. The leaders of G20 member s will continually develop their economies and energy systems to better reflect the evolution of the global energy and enviro nmental landscape. To facilitate the implementation of UNFCCC, the Paris Agreement [2] and the 2030 Agenda for Sustainable Development, we will strive to move forward in a coherent and mutually supportive manner that will provide us with significant opportuni ties for moderni sing our economies, enhancing competitiveness, stimulating employment and growth and ensuring socio -economic benefits of increased energy access. In addition, and in view of the increasing impacts of climate change, we will strive to increase the resilience of our communities and economies.

Our action will be guided by the Sustainable Development Goals (SDGs) and the Paris Agreement's aim to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by holding the increase in the global average temperature to well below 2°C above preindustrial levels and to pursueefforts to limit the temperature increase to 1.5°C above pre-industrial levels; by increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience; and by making finance flows consistent with a pathway towards low gr eenhouse gas emissions and climate resilient development. Our actions pursuant to the implementation of the Paris Agreement will reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

We emphasi se the urgency and priority of accelerating the implementation of pre -2020 commitments and actions, in particular , for parties to the Kyoto Protocol, the ratification of the Doha Amendment.

We share the common under standing of the energy system as the backbone of our economies. Diverse energy systems rely on affordable, secure and sustainable energy sources and clean technologies such as energy efficiency, renewable energy, natural gas and nuclear power for those countries that opt to use it, and advanced and cleaner fossil fuel technologies, employed in a sustainable manner. Such energy systemscan contribute greatly to achieving energy services for all at affordable prices and prosperity for future generations.We recognise that our actions contribute

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[1] The United States is currently in the process of reviewing m any of its policies related to climate change and continues to reserve its position on this document and its contents.

[2] Still subject to ratification for some G20 members.

...

substantially to global greenhouse gas emission reductions, global energy developments and global prosperity, leaving no one behind.

In facilitating well-balanced and economically viable long-term strategies and signals for investments in order to continually transform and enhance our economies and energy systems, G20 members will collaborate closely and balance a number of important factors, including inter alia energy security, energy access, infrastructure, en vironmental protection, poverty reduction, good health, quality education and quality job creation.

Welcoming the progress made under prior G20 Presidencies, in particular our Leaders' commitment from Hangzhou to identify new and sustainable drivers of gro wth, we take note of the OECD's report "Investing in Climate, Investing in Growth", the IEA/IRENA report "Perspectives for the Energy Transition: Investment Needs for a Low Carbon Energy System", as well as the World Bank report "Sovereign Climate and Disa ster Risk Pooling – Joining Forces to Manage Climate and Disaster Risks".

We intend to collaborate closely on climate and energy issues to successfully address the challenges of energy security and productivity, environmental protection, and to fully harve st the opportunities for innovation and economic growth.

We join our efforts in implementing this G20 Action Plan on Climate and Energy for Growth, whilst not duplicating other processes.

B. Nationally Determined Contributions

While the implementation of Nationally Determined Contributions (NDCs) will be different for every country, there is value in sharing experiences and good practices and providing for mutual learning. Acknowledging that the sum of our actions will make a di fference at global scale, our actions will be guided by our commitments under the Paris Agreement. NDC preparation and implementation will be more effective if embedded in broader national growth and development strategies.

G20 Actions

- We move forward to implementing our current and future Nationally Determined Contributions (NDCs) in line with the Paris Agreement. We will increase cooperation among ourselves and with non-G20 countries to facilitate mutual learning, good practice sharing and capacity-building, including through existing fora, inter alia, such as the NDC Partnership.
- Those G20 countries who provide development assistance will strengthen their efforts to support partner countries in NDC implementation. They will further align their developmen t

...

cooperation activities with partner countries' NDCs as well as the goals of the Paris Agreement, without compromising support for other sustainable development goals.

C. Long-Term Low Greenhouse Gas Emission Development Strategies

Despite our different national circumstances, we consider long-term low greenhouse gas emission development strategies to be a unique opportunity for national, country-specific approaches, guiding short(er) term planning and policy making in relevant sectors, mainstreaming climate action with efforts to promote inclusive economic growth and the implementation of the 2030 Agenda. They can incentivise respective investment flows and technological innovation. They will be living documents; there will be no one-size-fits-all solution.

G20 Actions

- Recognising different national circumstances and domestic procedures, capacities, needs, challenges and starting points, we recall the invitation to communicate, by 2020, mid-century, long-term low greenhouse gas emission development strategies.
- We welcome the submission of long-term strategies by some G20 countries and on-going efforts by others. We will engage in good-practice sharing and cooperation, which would also benefit non-G20 countries, including through existing fora, inter alia, such as the 2050 Pathways Platform.
- We recognise that long-term low greenhouse gas emission development strategies may inform our investments, inter alia in infrastructure.

D. A Reliable and Secure Framework for the Energy Sector Transition

Energy security, access to affordable, reliable and sustainable energy for all, and environmentally-friendly energy systems support sustainable, inclusive economic growth and job creation. The G20 members should lead the transition to sustainable and low greenhouse gas emission energy systems, taking into account different national circumstances, needs, challenges and priorities, such as domestic energy resources, economic development, energy access and energy demand dynamics. We envisage a transition to sustainable and low greenhouse gas emission energy systems that is technically feasible and economically viable and will jointly tackle the challenges related to its implementation.

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Robust, long -term energy sector development strategies and their timely implementation will increase investor certainty, attract necessary investments and help minimise the unexpected devaluation of assets in the energy sector. We stress the importance of increased invest ment in sustainable and clean energy technologies, energy efficiency, energy infrastructure and energy projects.

Energy transitions rely on a diversification of sustainable and clean energy technologies , but in particular energy efficiency will play an important role in all our future energy systems.

Recalling the G20 Principles on Energy Collaboration, we regard energy security as a guiding principle for the transformation of our energy systems, and we will continue to work on open, flexible and transparent markets for energy commodities and technologies as critical prerequisites for increased energy investments.

Innovation in sustainable and clean energy technologies is a top priority for G20members. We seek to jointly strengthen G20 collaboration on research, development and demonstration (RD+D) for technological innovation, such as Mission Innovation and other initiatives, to accelerate development and deployment of sustainable and clean energy technologies.

Scientific analysis, optional regular monitoring and policy adjustment, as well as voluntary collaboration and best practice exchange within the G20, among international and national research institutes, and the private sector, can provide signi ficant support to energy transition processes.

G20 Actions

- We jointly work to transform our energy systems into affordable, reliable, sustainable and low greenhouse gas emission energy systems as soon as feasible and consistent with the Paris Agreement, while taking into account national circumstances, needs, priorities and challenges as outlined in the NDCs.
- We encourage the exchange of best practices on national long -term low greenhouse gas emission energy sector strategies in the G20, including among national and international research institutes.
- We invite international organisations, such as IEA , IRENA and others where appropriate , to support our efforts in providing a regular update report with relation to the global transformation of the energy sector and further investment needs.

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D.1. Promote Energy Efficiency

Energy savings and a strong increase of the energy productivity ofour economies will be key for a successful transformation of our energy systems. Recognising SDG 7, which includes doubling the improvement rate of energy efficiency globally, we acknowledge cost-effective energy efficiency as one of the key options in reducing emissions, enhancing energy security, promoting economic growth and job creation , and strengthening industrial competitiveness. We highlight the importance of frameworks to encourage necessary additional investments in technological innovation in energy efficiency as a driver for economic growth.

We acknowledge the G20 Energy Efficiency Investment Toolkit, a set of voluntary options for participating countries to upscale energy efficiency in G20 economies , as an integrated approach to enhancing capital flows towards energy efficiency.

We stress the importance of strengthening and coordinating internationalcollaboration in the field of energy efficiency and developing frameworks for new business models and polic y options to ensure the necessary investments in energy efficiency measures in all sectors. We acknowledge the potential of all sectors, in particular the buildings sector, to significantly improve energy efficiency and take note of the Global Alliance for Buildings and Construction (GABC) as a voluntary initiative that has provided policy recommendations for all actors along the value chain for the development of national building strategies.

G20 Actions

- We seek to strengthen international collaboration on energy efficiency, avoi d duplication of work streams among international organi sations working on energy efficiency, and create opportunities for more efficient use of resources with greater impact of the collaboration. To accomplish this, we will explore how to create an EnergyEfficiency Hub. A task force under the leadership of the G20 Presidency with participation of G20 members will be set up to consider next steps and to develop the Hub's terms of reference and to report back to the G20 ESWG under the Argentinean Presidency. The concept note developed by the German Presidency will serve as an input for the work of the task force.
- We will continue the implementation of the G20 Energy Efficiency Leading Programme (EELP) and encourage international organisations to share sectoral policy options, continue exchange on best practices, and call on other countries to join our efforts.

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D.2. Scaling up Renewable Energy and other Sustainable Energy Sources

Renewable and other clean energy technologies play a significant role in t he transition to sustainable and low greenhouse gas emission energy system s in G20 economies, providing numerous co-benefits such as job creation, reduced air pollution and enhanced energy security.

While costs for renewable energy technologies have decre ased significantly in recent years, we need to continue to mobili se private sector investments and tackle the challenge of integrating rising shares of variable renewable energy into our energy systems while effectively enhancing energy security and ensuring a cost -efficient energy sector transition. Flexibility options such as interconnection and transmission capacities, smart grid technology, energy storage, flexible power plants, demand side management, and regional cross-border cooperation are important elements of delivering reliable, affordable and resilient energy. Depending on national circumstances and preferences, baseload generation remains an important element of energy security.

The energy transition needs to span the power generation and the end-use sectors alike, including enhanced renewables deployment in the heating and cooling, transport, and industry sectors. This includes all renewable energy sources, such as bioenergy, including second generation and other advanced biofuels, solar, wind, hydro, geothermal and ocean.

We recognise that, depending on national circumstances, natural gas can play an important role in the energy transition, moving towards a low greenhouse gas emission energy future, including for providing increased flexibility for the integration of variable renewable energy. A secure supply of natural gas depends on timely investments, diversification of sources, supplie rs, and routes. G20 economies will endeavour to improve the functioning, transparency and competitiveness of gas markets, with a strategic view of the gas supply chain including LNG at the global level.Gas storage can also provide a contribution to energy security.

In those countries that opt to use nuclear energy, it contributes to the reduction of greenhouse gas emissions and to baseload. Wecall upon those countries to uphold the highest standards of nuclear safety, security and non-proliferation.

We affirm the importance of using thebest available technologies and practices in order to address the environmental impacts, including greenhouse gas emissions, of the production, transport and consumption of fossil fuel s. We encourage countries that opt to use carbon capture, use and storage (CCUS) to continue to undertake RD&D and to collaborate on large -scale demonstration projects.

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G20 Actions

- We welcome the progress achieved with the Voluntary Action Plan on Renewable Energy adopted under the Chinese Presidency and the G20 Toolkit of Voluntary Options on Renewable Energy Deployment adopted under the Turkish Presidency, and we will continue implementing both, including risk mitigation instruments, in order to mobilise private sector investments.

D.3. Realising Access to Modern and Sustainable Energy Services for All

We reaffirm that access to affordable, reliable, sustainable, and modern energy is a key enabler of the Sustainable Development Goals, including poverty eradication, productive economic activity, environmental protection, socio-economic benefits, health, education, and gender empowerment. With this in mind, we recognise the ambition of Sustainable Development Goal 7 and the role of Sustainable Energy for All to provide data on the implementation.

G20 Actions

- We will encourage accelerating access to affordable, reliable, sustainable, and modern energy in Africa and the Asia Pacific and other regions to address energy poverty through national, bilateral and multilateral actions and initiatives. We will work to mobilise financial resources from private investors, development finance institutions, and multilateral development banks and hence improving investments in energy for productive use, transport, clean cooking, and heating and cooling.
- We will continue the implementation of the energy access action plans for Sub-Sahara Africa and the Asia-Pacific region, including reporting on progress at the Energy Sustainability Working Group Meeting, while exploring the potential to expand the geographic scope to other regions such as Latin America.
- We recognise the opportunity for voluntary support for the objectives of the African-led Renewable Energy Initiative (AREI), which aims at accelerating access to renewable energy in Africa and reducing energy poverty to enable an energy sector transition.

E. Enhancing Climate Resilience and Adaptation Efforts

The G20 will promote adaptation efforts and cooperation on climate resilience within the G20 and beyond. The impacts of climate change such as changes in temperature, precipitation, sea level rise and the frequency and intensity of extreme weather events are already noticeably impacting global

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ecosystems, economies, and societies. This puts at risk past and future progress towards the 2030 Agenda, including the goals of ending poverty and hunger. Whilst these impacts will be felt by all countries, poor and vulnerable people will be disproportionately affected. Faster and more effective responses for affected poor and vulnerable people, in particular women and children, are required. Therefore, taking appropriate steps to enhance adaptive capacity, including through support to adaptation planning, is becoming increasingly pressing.

The G20 can build on important work and initiatives, such as the Sendai Framework for Disaster Risk Reduction, to enhance adaptation efforts and scale up the resilience of people, sectors and regions. Appropriate risk finance and insurance solutions such as regional sovereign disaster risk pools, including the African Risk Capacity (ARC), the Caribbean Catastrophe Risk Insurance Facility (CCRIF) and the Pacific Catastrophe Risk Insurance Company (PCRAFI), need to be integrated into broader financial protection and comprehensive risk management strategies. Despite these efforts, significant protection gaps remain, particularly in Asia, Africa and other vulnerable regions.

G20 Actions

- We stress our support for national adaptation action and recognise efforts promoted by the National Adaptation Plan Global Network, the Global Centre of Excellence on Climate Adaptation, and the Adaptation Fund, among others. We encourage multilateral institutions to scale up financing for adaptation efforts of, and to improve access to adaptation finance for developing countries. We welcome the arrangements developed by the Green Climate Fund to aim for a balance between mitigation and adaptation action over time.
- Aiming to close the protection gap, we welcome the creation of a "Global Partnership for Climate and Disaster Risk Finance and Insurance Solutions", inviting relevant partners from G20 and other countries, international organisations and, as appropriate, civil society and private sector to engage according to their respective capacities. The Global Partnership builds on the work of existing platforms, such as InsuResilience, and voluntary engagement of its partners, taking into account the key lessons of ongoing work by the World Bank on "Sovereign Climate and Disaster Risk Pooling". The Global Partnership will develop synergies with other related initiatives, such as Climate Risks Early Warning Systems and the Global Facility for Disaster Reduction and Recovery. We encourage multilateral institutions to develop options for innovative climate and disaster risk finance solutions.
- We will develop, starting in 2017, a Work Program with the aim of sharing best-practices and of promoting enhanced efforts for adaptation and resilience-building at home and in our cooperation with partner countries. For this purpose, the G20 invites the World Bank,

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MDBs, and other international organis ations to assist in identifying potential areas of further cooperation in 2018.

F. Aligning Finance Flows

Significant investments will be required in the upcoming 15 years for establishing and modernising infrastructure. In light of different national circumstances, this can constitute significant opportunities for stimulating employment, poverty eradication and growth through the transformation towards sustainable, low greenhouse gas emission and climate resilient infrastructure. We recall the objective to align finance flows with the goals of the Paris Agreement. Mobilising climate finance from private sources will be key to addressing sign ificant investment needs for both adaptation and mitigation. Public finance will continue to play a significant role. We have different roles and responsibilities in this regard.

G20 Actions

- As spurring investments in low -emission and climate resilient de velopment is key, we as G20 governments will strive to create an enabling environment that is conducive to making public and private investments consistent with the goals of the Paris Agreement as well as with the national sustainable development priorities and economic growth. We recognise those private actors that have already started to better align their portfolios with the Paris Agreement as well as related Sustainable Development Goals and encourage similar initiatives.
- We reemphasise the commitment by developed countries to the goal of mobilising jointly USD 100 billion per year by 2020, and their intention to continue this through 2025, in the context of meaningful mitigation actions and transparency on implementation, from public and private sources, for mitigation and adaptation in developing countries, taking into account their needs and priorities. We recognise multilateral climate finance institutions such as the Green Climate Fund and the Global Environment Facility as important in supporting t he global response to climate change.
- We invite the OECD, UNEP and the World Bank to compile ongoing public and private activities within the G20 for making finance flows consistent with the Paris goals and, building on this, to analyse potential opportun ities for strengthening these efforts and present this analysis in 2018.
- The G20 Green Finance Study Group has completed environmental risk analysis in the financial sector. The Group' 2017 Synthesis Report includes voluntary options for encouraging

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environmental risk analysis and for improving the availability and relevance of publicly available environmental data for financial analysis, taking into account country circumstances.

- The industry-led Task Force on Climate-related Financial Disclosures has also completed work, which includes recommendations on voluntary disclosures of climate-related financial risks by corporates, reflecting the principle of materiality.
- We recognise that domestic mitigation and adaptation policies, including domestic economic and market-based instruments - if carefully designed and preserving environmental integrity -, can promote innovation and stimulate investments. Recognising different national preferences and circumstances, we encourage to initiate sharing good practices and experiences on domestic mitigation and adaptation policies, including domestic economic and market-based instruments as well as emission to value approaches.

F.1. Role of the Multilateral Development Banks (MDBs)

We take note of the mobilisation of climate finance by MDBs and recognise their efforts to support climate action, including the joint statement by MDBs at COP21. [3] MDBs' ability to provide large-scale financing, their potential to leverage private climate finance, and their presence around the globe place them in a good position to contribute to the transition to an increased adaptive capacity and a low greenhouse gas emission and climate-resilient development, including the achievement of related SDGs. Enhanced MDB climate actions will facilitate an effective response to clientcountries' demands, including by cooperating with national and regional institutions and fostering the mainstreaming of climate dimensions into development.

G20 Actions

- We call on all MDBs to identify opportunities for cooperation and enhanced action to address, inter alia, ambitious adaptation and mitigation finance, including coordinated support for country driven long-term strategies for low greenhouse gas emissions and respective technologies for climate-resilient development, as well as client countries' efforts for NDC

[3] African Development Bank, Asian Development Bank, European Bank of Reconstruction and Development, European Investment Bank, Inter-American Development Bank, World Bank Group (2015). Joint Statement by the Multilateral Development Banks at Paris COP21- Delivering Climate-Change Action at Scale: Our Commitment to Implementation.

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implementation and enabling environments, the development of risk -pooling and the enhancement of harmonised reporting of all MDBs' climate finance.

- Building on the Principles and Ambitions for crowding in private finance elaborated in the G20 International Financial Architecture Working Group, we call on MDBs to illustrate how private sector finance can be further mobilised to meet the objectives of the 2030 Agenda and the Paris Agreement.

F.2. Inefficient Fossil Fuel Subsidies that Encourage Wasteful Consumption

Inefficient fossil fuel subsidies (IFFS) that encourage wasteful consumption distort energy markets, impede investment in clean energy sources, place a strain on public budgets, and incentivise unsustainable infrastructure investments. Providing those in need with essential energy services, including the use of targeted cash transfers and other appropriate mechanisms, however, is still important. The US-Chinese peer review on IFFS was concluded, the German-Mexican peer review is ongoing and Indonesia and Italy have announced the continuation of their respective voluntary processes.

G20 Actions

- We reaffirm our commitment to rationalise and phase out, over the medium-term, inefficient fossil fuel subsidies that encourage wasteful consumption, recognising the need to support the poor and we will endeavour to make further progress in moving forward this commitment.
- We encourage all G20 members that have not yet done so to initiate a peer review of inefficient fossil fuel subsidies that encourage wasteful consumption as soon as feasible.
- We take note the OECD/IEA progress report and its options on how to further develop and improve the G20 peer review process based on recent experience and how to facilitate the phase out of inefficient fossil fuel subsidies that encourage wasteful consumption.

G. Global Action and Transformation in Other Fora and Processes

Striving to keep up the political momentum for global climate action, while respecting countries' different levels of engagement and national procedures, and without any intention to duplicate processes, we recognise the potential to generate synergies through countries' engagement in various other fora.

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G20 Actions

- We welcome the Marrakech Partnership for Global Climate Action and encourage the further engagement of cities, regions, companies, investors and a multitude of non -state actors to support parties in implementing the Paris Agreement. We further encourage these actors to register their actions through the UNFCCC NAZCA platform.
- We encourage G20 members to proceed with their respective domestic procedures for joining the Kigali Amendment to the Montreal Protocol to phase down hydrofluorocarbons.

H. Way Forward

The G20 Sustainability Working Group presents this G20 Action Plan on Climate and Energy for Growth to the Sherpas.

Welcoming the contributions by the G20 Engagement Groups to the German G20 Presidency, we look forward to continuing dialogue with civil society stakeholders from the public and business sectors, NGOs, academia and think tanks.

To: Jackson, Ryan[jackson.ryan@epa.gov]
From: Ryan Jackson
Sent: Mon 7/10/2017 9:55:31 AM
G20-leaders-declaration.pdf

https://www.g20.org/gipfeldokumente/G20-leaders-declaration.pdf

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Ryan Jackson
Ex. 6 - Personal Privacy

G20 GERMANY 2017

HAMBURG

G20 Leaders´ Declaration

Shaping an interconnected world

Hamburg, 7/8 July 2017

Preamble:

We, the Leaders of the G20, met in Hamburg, Germany on 7-8 July 2017 to address major global economic challenges and to contribute to prosperity and well-being.

Mastering the challenges of our age and shaping an interconnected world is the common goal of the G20 as our premier forum for international economic cooperation. The G20 revealed its strength during the global economic and financial crisis some ten years ago when it played a crucial role in stabilising economies and financial markets. What was true then continues to hold: We can achieve more together than by acting alone.

Progressing our joint objective in the G20 – strong, sustainable, balanced and inclusive growth – remains our highest priority.

Globalisation and technological change have contributed significantly to driving economic growth and raising living standards across the globe. However, globalisation has created challenges and its benefits have not been shared widely enough. By bringing together developed and emerging market economies, the G20 is determined to shape globalisation to benefit all people. Most importantly, we need to better enable our people to seize its opportunities.

We are resolved to tackle common challenges to the global community, including terrorism, displacement, poverty, hunger and health threats, job creation, climate change, energy security, and inequality including gender inequality, as a basis for sustainable development and stability. We will continue to work together with others, including developing countries, to address these challenges, building on the rules-based international order.

Expanding on the results of previous presidencies, in particular the 2016 G20 Summit in Hangzhou, we decide today to take concrete actions to advance the three aims of building resilience, improving sustainability and assuming responsibility.

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Sharing the Benefits of Globalisation

Prospering Global Economy: Current growth prospects are encouraging, though the pace of growth is still weaker than desirable. We reaffirm our commitment to international economic and financial cooperation to further strengthen growth and safeguard against downside risks. We will continue to use all policy tools – monetary, fiscal and structural – individually and collectively to achieve our goal of strong, sustainable, balanced and inclusive growth, while enhancing economic and financial resilience. Monetary policy will continue to support economic activity and ensure price stability, consistent with central banks' mandates. Fiscal policy will be used flexibly and be growth-friendly while ensuring debt as a share of GDP is on a sustainable path. We reinforce our commitment to structural reforms. We reaffirm our previous exchange rate commitments. We will strive to reduce excessive global imbalances in a way that supports global growth. We will promote greater inclusiveness, fairness and equality in our pursuit of economic growth and job creation. To these ends, we endorse the Hamburg Action Plan.

Trade and Investment: International trade and investment are important engines of growth, productivity, innovation, job creation and development. We will keep markets open noting the importance of reciprocal and mutually advantageous trade and investment frameworks and the principle of non-discrimination, and continue to fight protectionism including all unfair trade practices and recognise the role of legitimate trade defence instruments in this regard. We will strive to ensure a level playing field, in particular by promoting a favourable environment for trade and investment in this regard. We further reaffirm the importance of transparency for predictable and mutually beneficial trade relations. To this end, we value the monitoring activities by the WTO, UNCTAD and OECD within their existing mandates. We commit to further strengthen G20 trade and investment cooperation. We call on the OECD, WTO, World Bank Group and IMF to continue their work to better understand trade impacts and report back to G20 Leaders in 2018.

We recognise that the benefits of international trade and investment have not been shared widely enough. We need to better enable our people to seize the opportunities and benefits of economic globalisation. We agree to exchange experiences on the mitigation of the adjustment costs of trade and investment liberalisation and technological change, and on appropriate domestic policies, as well as to enhance international cooperation towards inclusive and sustainable global growth.

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We underline the crucial role of the rules-based international trading system. We note the importance of bilateral, regional and plurilateral agreements being open, transparent, inclusive and WTO-consistent, and commit to working to ensure they complement the multilateral trade agreements. We welcome the entry into force of the WTO Trade Facilitation Agreement and call for its full implementation including technical assistance to developing countries. We commit to work together with all WTO members to make the eleventh WTO Ministerial Conference a success. To further improve the functioning of the WTO, we will cooperate to ensure the effective and timely enforcement of trade rules and commitments as well as improve its negotiating, monitoring and dispute settlement functions.

International investment can play an important role in promoting inclusive economic growth, job creation and sustainable development, and requires an open, transparent and conducive global policy environment. We will seek to identify strategies to facilitate and retain foreign direct investment.

Excess Capacities: Recognising the sustained negative impacts on domestic production, trade and workers due to excess capacity in industrial sectors, we commit to further strengthening our cooperation to find collective solutions to tackle this global challenge. We urgently call for the removal of market-distorting subsidies and other types of support by governments and related entities. Each of us commits to take the necessary actions to deliver the collective solutions that foster a truly level playing field. Therefore, we call on the members of the Global Forum on Steel Excess Capacity, facilitated by the OECD, as mandated by the Hangzhou Summit, to fulfil their commitments on enhancing information sharing and cooperation by August 2017, and to rapidly develop concrete policy solutions that reduce steel excess capacity. We look forward to a substantive report with concrete policy solutions by November 2017, as a basis for tangible and swift policy action, and follow-up progress reporting in 2018.

Sustainable Global Supply Chains: Global Supply Chains can be an important source of job creation and balanced economic growth. However challenges for achieving an inclusive, fair and sustainable globalisation remain. In order to achieve sustainable and inclusive supply chains, we commit to fostering the implementation of labour, social and environmental standards and human rights in line with internationally recognised frameworks, such as the UN Guiding Principles on Business and Human Rights and the ILO Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy. Those countries that adhere to the OECD Guidelines for Multinational Enterprises (OECD MNE Guidelines) commit to fostering them and welcome others to follow.

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We will work towards establishing adequate policy frameworks in our countries such as national action plans on business and human rights and underline the responsibility of businesses to exercise due diligence. We will take immediate and effective measures to eliminate child labour by 2025, forced labour, human trafficking and all forms of modern slavery. We welcome the Vision Zero Fund for to prevent work-place related deaths and injuries and encourage enterprises and others to join.

We emphasise that fair and decent wages as well as social dialogue are other key components of sustainable and inclusive global supply chains. We support access to remedy and, where applicable, non-judicial grievance mechanisms, such as the National Contact Points for the OECD MNE Guidelines (NCPs). We will encourage multinational companies to conclude international framework agreements as appropriate. Recognising the ongoing work of the Global Partnership for Financial Inclusion (GPFI), we promote better access to financing, technology, and training facilities that help improve the capacity of micro, small and medium enterprises to integrate into sustainable and inclusive global supply chains.

Harnessing Digitalisation: Digital transformation is a driving force of global, innovative, inclusive and sustainable growth and can contribute to reducing inequality and achieving the goals of the 2030 Agenda for Sustainable Development. To this end, we need to bridge digital divides along multiple dimensions, including income, age, geography and gender. We will strive to ensure that all our citizens are digitally connected by 2025 and especially welcome infrastructure development in low-income countries in that regard. We will promote digital literacy and digital skills in all forms of education and life-long learning. We recognise that information and communication technology (ICT) plays a crucial role in modernizing and increasing efficiency in public administration. We recognise the important role that SMEs and start-ups play in the development of a full range of new and innovative business models and will promote better access to financial resources and services and a more entrepreneurial friendly environment.

We aim to foster favourable conditions for the development of the digital economy and recognise the need to ensure effective competition to foster investment and innovation. We will continue to promote effective cooperation of all stakeholders and encourage the development and use of market- and industry-led international standards for digitised production, products and services that are based on the principles of openness, transparency and consensus and standards should not act as barriers to trade, competition or innovation. They can promote interoperability and security in the use of ICT.

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Trust in digital technologies requires effective consumer protection, intellectual property rights, transparency, and security in the use of ICT. We support the free flow of information while respecting applicable legal frameworks for privacy, data protection and intellectual property rights. The G20 Roadmap for Digitalisation will help us guide our future work.

We are committed to help ensure a secure ICT environment in which all sectors are able to enjoy its benefits and reaffirm the importance of collectively addressing issues of security in the use of ICTs.

We will constructively engage in WTO discussions relating to E-commerce and in other international fora with responsibilities related to various aspects of digital trade to foster digital economy development and trade. We will sustain and improve, as appropriate, predictable and transparent frameworks on digital trade. Intensified and concerted action is needed to enhance the ability of developing and least developed countries to more fully engage in digital trade.

Boosting Employment: Well-functioning labour markets contribute to inclusive and cohesive societies and resilient economies. Digitalisation offers the opportunity for creating new and better jobs, while at the same time raising challenges regarding skills, social protection and job quality. We therefore recognise the need to educate and train people with the necessary skills for the future of work, the importance of opportunities to re- and upskill throughout their working lives, and assist them to successfully adapt to change, in accordance with each member´s domestic social framework.

Acknowledging the increasing diversity of employment, we will assess its impact on social protection and working conditions and continue to monitor global trends, including the impact of new technologies, demographic transition, globalisation and changing working relationships on labour markets. We will promote decent work opportunities during the transition of the labour market. We look forward to a continuous exchange on national experiences and practices.

We recognise the important role of vocational education and training, including quality apprenticeship in integrating young people into the labour market. In this regard, we acknowledge that it is particularly effective when it provides coordinated high quality school- and work-based learning and when it is built on cooperation among governments, business communities and social partners.

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Building Resilience

Resilient Global Financial System: An open and resilient financial system, grounded in agreed international standards, is crucial to supporting sustainable growth. We remain committed to the finalisation and timely, full and consistent implementation of the agreed G20 financial sector reform agenda. We will work to finalise the Basel III framework without further significantly increasing overall capital requirements across the banking sector, while promoting a level playing field. We will continue to closely monitor and, if necessary, address emerging risks and vulnerabilities in the financial system. We emphasise the considerable progress made towards transforming shadow banking into resilient market based finance since the financial crisis and welcome the FSB assessment of the monitoring and policy tools available to address risks from shadow banking. We support the FSB's work to analyse the effects of financial regulatory reforms and the structured framework for post-implementation evaluation. Acknowledging that malicious use of ICT could endanger financial stability, we welcome the progress of the FSB's work and look forward to a stock-take report in October 2017.

International Financial Architecture: We need strong, effective and representative global economic and financial institutions to underpin growth and sustainable development. As laid out in the Hamburg Action Plan, we will continue to improve the system underpinning international capital flows and emphasise the need to promote sound and sustainable financing practices. We will enhance the international financial architecture and the global financial safety net with a strong, quota-based and adequately resourced IMF at its centre. We look forward to the completion of the 15th General Review of IMF Quotas, including a new quota formula, by the Spring Meetings 2019 and no later than the Annual Meetings 2019, and support ongoing work to further enhance the effectiveness of its lending toolkit. We endorse the MDBs' Joint Principles and Ambitions on Crowding-In Private Finance ("Hamburg Principles and Ambitions") and welcome their work on optimising balance sheets and boosting investment in infrastructure and connectivity.

International Tax Cooperation and Financial Transparency: We will continue our work for a globally fair and modern international tax system and welcome international cooperation on pro-growth tax policies. We remain committed to the implementation of the Base Erosion and Profit Shifting (BEPS) package and encourage all relevant jurisdictions to join the Inclusive Framework. We look forward to the first automatic exchange of financial account information under the Common Reporting Standard (CRS) in September 2017. We call on all relevant jurisdictions to begin exchanges by

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September 2018 at the latest. We commend the recent progress made by jurisdictions to meet a satisfactory level of implementation of the agreed international standards on tax transparency and look forward to an updated list by the OECD by our next Summit reflecting further progress made towards implementation. Defensive measures will be considered against listed jurisdictions. We continue to support assistance to developing countries in building their tax capacity. We are also working on enhancing tax certainty and with the OECD on the tax challenges raised by digitalisation of the economy. As an important tool in our fight against corruption, tax evasion, terrorist financing and money laundering, we will advance the effective implementation of the international standards on transparency and beneficial ownership of legal persons and legal arrangements, including the availability of information in the domestic and cross-border context.

Safeguarding against Health Crises and Strengthening Health Systems: The G20 has a crucial role in advancing preparedness and responsiveness against global health challenges. With reference to the results of the G20 health emergency simulation exercise, we emphasise the value of our ongoing, trust-building, cross-sectoral cooperation. We recall universal health coverage is a goal adopted in the 2030 Agenda and recognize that strong health systems are important to effectively address health crises. We call on the UN to keep global health high on the political agenda and we strive for cooperative action to strengthen health systems worldwide, including through developing the health workforce. We recognise that implementation of and compliance with the International Health Regulations (IHR 2005) is critical for efficient prevention, preparedness and response efforts. We strive to fully eradicate polio. We also acknowledge that mass movement of people can pose significant health challenges and encourage countries and International Organisations to strengthen cooperation on the topic. We support the WHO´s central coordinating role, especially for capacity building and response to health emergencies, and we encourage full implementation of its emergency reform. We advocate for sufficient and sustainable funding to strengthen global health capacities, including for rapid financing mechanisms and the WHO's Health Emergencies Programme. Furthermore, we see a need to foster R&D preparedness through globally coordinated models as guided by the WHO R&D Blueprint, such as the Coalition for Epidemic Preparedness Innovations (CEPI).

Combatting Antimicrobial Resistance (AMR): AMR represents a growing threat to public health and economic growth. To tackle the spread of AMR in humans, animals and the environment, we aim to have implementation of our National Action Plans, based on a One-Health approach, well under way by the end of 2018. We will promote

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the prudent use of antibiotics[1] in all sectors and strive to restrict their use in veterinary medicine to therapeutic uses alone. Responsible and prudent use of antibiotics in food producing animals does not include the use for growth promotion in the absence of risk analysis. We underline that treatments should be available through prescription or the veterinary equivalent only. We will strengthen public awareness, infection prevention and control and improve the understanding of the issue of antimicrobials in the environment. We will promote access to affordable and quality antimicrobials, vaccines and diagnostics, including through efforts to preserve existing therapeutic options. We highlight the importance of fostering R&D, in particular for priority pathogens as identified by the WHO and tuberculosis. We call for a new international R&D Collaboration Hub to maximise the impact of existing and new anti-microbial basic and clinical research initiatives as well as product development. We invite all interested countries and partners to join this new initiative. Concurrently, in collaboration with relevant experts including from the OECD and the WHO, we will further examine practical market incentive options.

Improving Sustainable Livelihoods

Energy and Climate: A strong economy and a healthy planet are mutually reinforcing. We recognise the opportunities for innovation, sustainable growth, competitiveness, and job creation of increased investment into sustainable energy sources and clean energy technologies and infrastructure. We remain collectively committed to mitigate greenhouse gas emissions through, among others, increased innovation on sustainable and clean energies and energy efficiency, and work towards low greenhouse-gas emission energy systems. In facilitating well-balanced and economically viable long-term strategies in order to transform and enhance our economies and energy systems consistent with the 2030 Agenda for Sustainable Development, G20 members will collaborate closely. Recalling the G20 Principles on Energy Collaboration, we regard energy security as one of the guiding principles for the transformation of our energy systems, and we will continue to work on open, flexible, and transparent markets for energy commodities and technologies. We welcome international cooperation on the development, deployment, and commercialisation of sustainable and clean energy technologies and support financing by Multilateral Development Banks to promote universal access to affordable, reliable, sustainable and clean energy.

[1] Noting differences in the G20 country definitions of the term "antibiotics" and referring here to those antibiotics with an impact on human health, including those antimicrobials that are critically important for human medicine as defined by the WHO .

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We take note of the decision of the United States of America to withdraw from the Paris Agreement. The United States of America announced it will immediately cease the implementation of its current nationally-determined contribution and affirms its strong commitment to an approach that lowers emissions while supporting economic growth and improving energy security needs. The United States of America states it will endeavour to work closely with other countries to help them access and use fossil fuels more cleanly and efficiently and help deploy renewable and other clean energy sources, given the importance of energy access and security in their nationally-determined contributions.

The Leaders of the other G20 members state that the Paris Agreement is irreversible. We reiterate the importance of fulfilling the UNFCCC commitment by developed countries in providing means of implementation including financial resources to assist developing countries with respect to both mitigation and adaptation actions in line with Paris outcomes and note the OECD's report "Investing in Climate, Investing in Growth". We reaffirm our strong commitment to the Paris Agreement, moving swiftly towards its full implementation in accordance with the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances and, to this end, we agree to the G20 Hamburg Climate and Energy Action Plan for Growth as set out in the Annex.

Leading the Way towards Sustainable Development: The adoption of the 2030 Agenda represented a milestone towards global sustainable development. We call on countries to work with stakeholders to strive towards its ambitious and integrated implementation and timely realisation in accordance with national circumstances. We commit to further align our actions with the 2030 Agenda for Sustainable Development and its integral part, the Addis Ababa Action Agenda on Financing for Development, domestically and internationally, including in support of developing countries and the provision of public goods.

Building on the G20's Action Plan on the 2030 Agenda for Sustainable Development, the Hamburg Update emphasises our collective and concrete commitments. We support the central role of the high-level political forum on sustainable development and other key UN processes towards achieving the Sustainable Development Goals. We will also engage in voluntary peer learning on the implementation of the 2030 Agenda and call upon others to join this important exercise as a complementary action towards Voluntary National Reviews.

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The Annual Progress Report documents for the first time progress on selected prior G20 commitments on the implementation of the 2030 Agenda. Recognising the importance of financial inclusion as a multiplier for poverty eradication, job creation, gender equality, and women's empowerment, we support the ongoing work of the Global Partnership for Financial Inclusion and welcome the 2017 G20 Financial Inclusion Action Plan. We note the UN Secretary-General´s proposal to establish an International Finance Facility for education taking into account other existing initiatives, such as the Global Partnership for Education and Education Cannot Wait, and look forward to examining it in further detail under Argentina's Presidency with a view to making recommendations on it.

Women's Empowerment: Enhanced equal access to the labour market, property, quality employment and financial services for women and men are fundamental for achieving gender equality and full realisation of their rights as well as a prerequisite for sustainable and inclusive growth. We are making progress in achieving our 2014 Brisbane commitment to reduce the gender gap in labour force participation by 25 percent by 2025 but agree that more needs to be done. We also commit to take further action to improve the quality of female employment and eliminate employment discrimination, and reduce gender compensation gaps and provide women with protection from all forms of violence. We will improve women´s access to labour markets through provision of quality education and training, supporting infrastructure, public services and social protection policies and legal reforms, where appropriate.

Digitalisation and access to ICT serve as powerful catalysts for the economic empowerment and inclusion of women and girls. Access to STEM (Science, Technology, Engineering and Mathematics) related trainings and occupations is therefore key to establish an enabling environment for women's empowerment. We welcome the launch of the #eSkills4Girls initiative to promote opportunities and equal participation for women and girls in the digital economy, in particular in low income and developing countries (see Annex).

In order to scale up support for women´s entrepreneurship, we welcome the launch of the Women Entrepreneurs Financing Initiative (We-Fi), housed at the World Bank Group (see Annex). The We-Fi will support ongoing G20 efforts to reduce barriers to financial inclusion and increase women´s access to capital, markets and technical assistance as well as contribute to achieving the goals of the G20 Africa Partnership and the G20 Entrepreneurship Action Plan. We will also establish a Business Women Leaders' Taskforce, which will, in close cooperation with the W20 and B20, bring together business women from G20 countries to examine ways to increase women´s

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participation in the economy and will make recommendations at next year's summit on the implementation of G20 commitments regarding the economic empowerment of women.

Towards Food Security, Water Sustainability and Rural Youth Employment: Water is an essential and precious resource. In order to achieve food security, we are committed to increase agricultural productivity and resilience in a sustainable manner, while aiming to protect, manage and use efficiently water and water-related ecosystems. In order to harness the potential of ICT, we stress the need for strengthened cooperation on ICT in agriculture and underline the importance of access to high-speed digital services for farmers and of adequately serving rural areas. To enhance transparency in global food markets, we call for a strengthening of the Agricultural Market Information System (AMIS) and an active engagement of its entire membership. We underline that making markets function better can contribute to reducing food price volatility and enhance food security. It is vital for farmers to be profitable and, along with consumers, have access to national, regional and international markets.

We launch the G20 Initiative for Rural Youth Employment in developing countries with a focus on Africa. This Initiative will, in alignment with developing countries' strategies, contribute to creating 1.1 million new jobs by 2022 and to providing innovative skills development programmes for at least 5 million young people over the next five years. Recognising the famine in some areas of South Sudan and risk of famine in Somalia, Yemen and North-Eastern Nigeria, we are more than ever committed to act with the required urgency, supporting UN agencies and other humanitarian and development organisations in a coordinated and comprehensive response to save lives and support conditions for sustainable development. We recognise the contributions made by different G20 members in line with the UN appeal for humanitarian assistance which represents over two thirds of the funding received for immediate requirements. We will further strengthen our humanitarian engagement and reaffirm our commitment to addressing the underlying causes of recurrent and protracted crises.

Resource Efficiency and Marine Litter: We launch two initiatives to contribute to the implementation of the 2030 Agenda and to reflect our commitment to sustainable development, as outlined in the Annexes. The G20 Resource Efficiency Dialogue will exchange good practices and national experiences to improve the efficiency and sustainability of natural resource use across the entire life cycle, and to promote sustainable consumption and production patterns. The G20 Marine Litter Action Plan seeks to prevent and reduce marine litter, including by considering its socio-economic aspects.

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Assuming Responsibility

Africa Partnership: We launch the G20 Africa Partnership in recognition of the opportunities and challenges in African countries as well as the goals of the 2030 Agenda. Our joint efforts will foster sustainable and inclusive economic growth and development, in response to the needs and aspirations of African countries, contributing to create decent employment particularly for women and youth, thus helping to address poverty and inequality as root causes of migration. The Partnership includes related initiatives, such as #eSkills4Girls, Rural Youth Employment, African Renewable Energy and facilitates investment Compacts, as outlined in the Annex.

We welcome the outcomes of the G20 Africa Partnership Conference in Berlin, which highlighted the need for joint measures to enhance sustainable infrastructure, improve investment frameworks as well as support education and capacity building. Individual priorities for "Investment Compacts" were put forward by Côte d'Ivoire, Ethiopia, Ghana, Morocco, Rwanda, Senegal and Tunisia. Led by the respective African countries, the African Development Bank, IMF and WBG as well as the G20 and other partners, these Compacts aim to mobilise private investment as well as promote efficient use of public funding.

We are ready to help interested African countries and call on other partners to join the initiative. We support the goals of the Partnership through complementary initiatives as well as encourage the private sector to seize African economic opportunities in supporting sustainable growth and employment creation.

Based on equal partnership, we strongly welcome African ownership and commit to align our joint measures with regional strategies and priorities, in particular the African Union's Agenda 2063 and its Programme for Infrastructure Development in Africa (PIDA). The African Union and its specialised agency, the New Partnership for Africa's Development (NEPAD), are important partners in its implementation and monitoring.

Stepping up Coordination and Cooperation on Displacement and Migration: The world is experiencing historic levels of migration and forced displacement. While migration is influenced by many political, social and economic developments, the main drivers of forced displacement include conflicts, natural disasters as well as human rights violations and abuses. Migration and forced displacement trends are of major relevance for countries of origin, transit and destination. The social and economic benefits and opportunities of safe, orderly and regular migration can be substantial. Forced displacement and irregular migration in large movements, on the other hand, often present complex challenges.

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We support those countries that choose to develop pathways for migration, underline the importance of nationally determined integration and endorse the G20 Policy Practices for the Fair and Effective Labour Market Integration of Regular Migrants and Recognised Refugees. We emphasise the sovereign right of states to manage and control their borders and in this regard to establish policies in their own national interests and national security, as well as the importance that repatriation and reintegration of migrants who are not eligible to remain be safe and humane. We commit to countering migrant smuggling and trafficking in human beings and we are determined to take action against people smugglers and traffickers.

We seek to address the root causes of displacement. We call for concerted global efforts and coordinated and shared actions, in particular with respect to countries and communities that are under high social, political and financial pressure, and for combining both an emergency approach and a long-term one. To this end, we acknowledge the importance of establishing partnerships with countries of origin and transit. We will promote sustainable economic development in those countries.

We commit to addressing the distinct needs of refugees and migrants, in particular close to their region of origin and, when applicable, to enable them to return home safely. At the same time, we place special emphasis on vulnerable groups, including women at risk and children, particularly those unaccompanied, and to protecting the human rights of all persons regardless of their status.

We call for improving the governance of migration and providing comprehensive responses to displacement and recognise the need to develop tools and institutional structures accordingly. Therefore, we look forward to the outcome of the UN process towards Global Compacts on Refugees and for Safe, Orderly and Regular Migration, both envisaged to be adopted in 2018. We emphasise the need for monitoring global displacement and migration, as well as its economic consequences. To this end, we ask the OECD, in cooperation with ILO, IOM and UNHCR, to update us annually on trends and policy challenges.

Fighting Corruption: We remain committed to fighting corruption, including through practical international cooperation and technical assistance, and will continue to fully implement the G20 Anti-Corruption Action Plan 2017-18. We endorse four sets of High Level Principles aimed at fostering integrity in the public and private sector. By endorsing the High Level Principles on the Liability of Legal Persons, we commit to ensuring that not only individual perpetrators but also companies benefitting from corruption can be held liable. We commit to organising our public administrations to

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be more resilient against corruption. We will intensify our fight against corruption related to illegal trade in wildlife and wildlife products. Wildlife trafficking is a threat to the planet's biodiversity, economic development, and, among others, health and security, and is facilitated by high levels of corruption, which the G20 cannot tolerate. We also endorse the High Level Principles on Countering Corruption in Customs and publish a guide on requesting international cooperation in civil and administrative proceedings. We will continue our work to address integrity in sports and urge international sports organisations to intensify their fight against corruption by achieving the highest global integrity and anti-corruption standards. In this respect, we strive for a common understanding regarding corruption risks in bids to host major sport events. We are also committed to fighting corruption in contracts, including in the natural resources sector. We call for ratification and implementation by all G20 members of the UN Convention against Corruption and for a strong involvement in its review process.

We thank Germany for hosting a successful Hamburg Summit and its contribution to the G20 process, and look forward to meeting again in Argentina in 2018, in Japan in 2019 and in Saudi Arabia in 2020.

Agreed Documents

Hamburg Action Plan
Climate and Energy Action Plan for Growth
Hamburg Update: Taking forward the G20 Action Plan on the 2030 Agenda
Annual Progress Report 2017
G20 Action Plan on Marine Litter
G20 Africa Partnership
G20 Initiative for Rural Youth Employment
High Level Principles on the Liability of Legal Persons for Corruption
High Level Principles on Organizing against Corruption
High Level Principles on Countering Corruption in Customs
High Level Principles on Combatting Corruption related to Illegal Trade in Wildlife and Wildlife Products
G20 Initiative #eSkills4Girls
Women Entrepreneurs Finance Initiative
G20 Resource Efficiency Dialogue

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To: Jackson, Ryan[jackson.ryan@epa.gov]
From: CEO Report
Sent: Mon 6/5/2017 11:02:32 AM
Subject: CEO Report: Funding season — Debt limit talks — Focus on the Fed — Mnuchin's review

View online version

06/05/2017 07:00 AM EDT

By ALEX WEPRIN (aweprin@politico.com; @alexweprin)

Funding season: June is always a furiously busy time for work on funding the federal government. And that process is sure to be particular disorderly this month as Congress gets back to work after the Memorial Day recess. For one thing, Republican leaders have yet to pass a budget resolution, forcing them to trudge blindly through spending season without the guiding light of overall spending levels, Pro Budget and Appropriations editor Jennifer Scholtes notes. Congress is supposed to pass its own budget by April 15 each year, but Republican leaders aren't expected to release that document for several weeks. So lawmakers are likely to be stuck in this limbo for most of the month — if not longer.

Despite that self-imposed setback, spending committee leaders will call up Trump administration officials this month to testify on funding priorities for their agencies and will continue meeting behind closed doors for some informal budget-writing sessions.

Beyond the basic challenge of trying to pen funding levels without knowing overall budget limits, GOP leaders are already starting to worry about their ability to ultimately pass the 12 federal spending bills before government funding runs out on Sept. 30. If they learned anything from the last go-round this spring, it's that they will be hard-pressed to get enough Democratic support without scrapping some of President Donald Trump's biggest priorities — like border wall funding. And Trump has already threatened to hold strong in the next game of political chicken, tweeting last month that "our country needs a good 'shutdown' in September to fix mess!"

Debt-limit talks: While lawmakers thought they had until late September or early October to act on the debt limit, Trump administration officials now says that deadline will probably need to be moved up by a few weeks, Jennifer reports. And since Congress is out of session in August, leaders are scrambling to come up with a deal that could pass before the government defaults on its debt. A compromise will be hard to come by, though, since both parties are internally divided over whether to go for a "clean increase" in the debt ceiling or whether to throw in spending cuts and boosts.

FINANCIAL SERVICES

Focus on the Fed: This will be a pivotal month for the Federal Reserve, with the central bank expected to push ahead with its ambitious agenda. At its June 13-14 meetings, the Fed's top policymaking body is likely to raise its main borrowing rate once again as part of its plan to end the economic stimulus that it began during the financial crisis. The Fed will telegraph its intentions going forward, keeping an eye on economic data that's showing possible signs of slowing inflation, which could undercut plans for future rate hikes. The central bank has also signaled it will clarify how it plans to unwind its massive $4.5 trillion balance sheet, a delicate operation since it risks rattling the financial markets.

Mnuchin's review: The Treasury Department will in the coming days release the first in a series of eagerly awaited reports on how financial regulations can be overhauled, an initial step in fulfilling a campaign promise by Trump. Treasury Secretary Steven Mnuchin has indicated that the first report will include recommendations on the Volcker rule, a hotly contested measure that prevents banks from engaging in proprietary trading, and community banking.

Stress tests: At the end of the month, the Fed will announce the results of its annual stress tests on the biggest U.S. banks, which could affect dividend payments and stock buybacks planned by the lenders. For the first time this year, none of the banks with less than $250 billion in assets will be subject to the portion of the tests that measures the firms' risk-management procedures, the first in what is likely to be a move to ease the examinations.

Showdown on Dodd-Frank repeal: One of the House's first tasks when it returns from the Memorial Day recess will be voting on the Financial CHOICE Act, which would repeal and replace banking regulations from the Dodd-Frank law. House Financial Services Chairman Jeb Hensarling has agreed to remove a section of the bill that was the most controversial among Republicans — a repeal of the debit card swipe fee cap known as the Durbin Amendment. The Senate Banking Committee will take a step toward drafting its own legislation with hearings focused on smaller lenders.

Housing reform: Look for mortgage reform to bubble up in June. The Senate is expected to confirm Pam Patenaude as deputy secretary of HUD after her June 6 confirmation hearing. And the National Association of Home Builders will have its annual member fly-ins to gin up support for overhauling Fannie Mae and Freddie Mac. — *Mark McQuillan*

TAX

Clock's ticking: If the White House and Republican leaders in Congress want to keep their promise of enacting tax reform before the end of the year, they'll have to pick up the pace this month. Both sides say they are hammering out details behind closed doors, while House Republican leaders have kept up their public sales job, saying the

stars are aligned for a once-in-a-generation overhaul of the tax code. But there are distractions galore. First there is that debt limit increase, which is never an easy lift. And the Senate is still working on an Obamacare repeal-and-replace plan. Then there's that month-long recess looming in August. National Economic Council Director Gary Cohn said that the White House will likely wait to release its detailed tax plan until after the recess.

If the Senate's Obamacare bill lands this month, there will be plenty of tax implications. The House's plan eliminated taxes used to fund the Affordable Care Act, notably the 3.8 percent investment tax on high-income earners. It would also phase out a 0.9 percent Medicare surcharge those earners pay. But Republican senators don't seem wedded to getting rid of those levies. "That's hard to say right now. We just have to see," Senate Finance Chairman Orrin Hatch said last month. "It's going to be negotiated." The Senate may also go its own way on tax credits designed to make health insurance more affordable for lower-income Americans. The House bill pegged the tax credits to age. But senators want to follow Obamacare's model of basing premium assistance on income.

Staffing up: The Senate could also take up the nomination of David Kautter to be the Treasury Department's assistant secretary for tax policy, depending on how fast the vetting goes. It's a key position at Treasury, especially with tax reform in the works. If Kautter is confirmed — and, so far, there's no reason to think he won't be — it could also free the logjam on deputy assistant secretary vacancies in Treasury's tax office. Kautter, who was nominated by Trump last month, has a long tax policy resume. He's been working most recently as partner-in-charge of the Washington National Tax practice for the consulting firm RSM US LLP. He's also been an instructor at American University, following more than three decades at Ernst and Young. Kautter also worked on Capitol Hill as tax legislative counsel for former Sen. John Danforth (R-Mo.). — *Toby Eckert*

CYBERSECURITY

It's here, now what: Trump in May finally signed his long-awaited cybersecurity executive order, which launched sweeping reviews of the federal government's digital vulnerabilities and directs agencies to adopt specific security practices. Now agencies are getting down to work. In the next month, officials will be working toward a July 14 deadline to submit an "action plan" detailing how they will implement the desired security practices, which are outlined in a cybersecurity framework developed by the technical standards agency NIST. By July 14, agencies will also have to submit their quarterly cybersecurity report, as required by the Federal Information Security Modernization Act, or FISMA. The Office of Management and Budget and the Department of Homeland Security will then create a government-wide analysis for Trump based on those reports.

No more leaky pipes: The White House and Congress are also taking action to upgrade the government's aging computer networks, which cost the government billions to maintain. Jared Kushner's Office of American Innovation will hold a meeting on June 19 with a panoply of tech-sector executives. The group will discuss IT modernization ideas. And in Congress, the White House is backing a House-passed bill that would earmark hundreds of millions of dollars for government network improvements. Currently, though, the Senate has no plans to take up the bill, which has significant bipartisan backing. Observers say the measure needs a vocal upper chamber champion to break through the congressional clutter.

Cyber to get $$: The Senate and House versions of the annual defense policy bill are expected to drop this month, and both will include a major focus on expanding the country's cyber war-fighting capabilities. Lawmakers want to use the bill to make cybersecurity a more desirable career path within the military. They fear that in the rush to fill out U.S. Cyber Command's Cyber Mission Force by the 2018 fiscal year, the military has failed to take steps to keep cyber service members in digitally focused fields.

Trump has also signaled his preference for boosting cyber spending within the Pentagon and across much of the government. His full budget request seeks $647 million for U.S. Cyber Command, a nearly 16 percent increase over the most recent fiscal year, according to Cyber Command head Adm. Michael Rogers. It also requests a bump for the DHS office that works with companies to detect and mitigate digital assaults and calls for an increase in money for the FBI to fight cybercrime. In June, the Senate will hold a hearing on the DHS budget request, and likely will schedule one on the Justice Department's funding asks as well. — *Cory Bennett*

AGRICULTURE

Getting the band together: The first meeting of the White House Interagency Task Force on Agriculture and Rural Prosperity is expected in the next few weeks, and launching its efforts will likely be a top concern for Agriculture Secretary Sonny Perdue this month. Trump tapped Perdue to lead the group, which he authorized via an executive order signed on the Agriculture secretary's first day in office, in late April. The panel will bring together Cabinet members and other officials; it must report to Trump in October on regulations and other policies that are hampering economic growth for farmers and for rural America.

Covering Perdue's flanks: The Agriculture secretary and the White House are also likely this month to announce picks for key sub-cabinet-level positions — officials who will be essential to Perdue's ability to drive his agenda. The secretary is said to have settled on American Soybean Association CEO Stephen Censky for deputy secretary and is eyeing Iowa Agriculture Secretary Bill Northey and Indiana Agriculture Director Ted McKinney for two important undersecretary positions that will be created as part of

the secretary's USDA reorganization.

Farm bill always on the mind: The House Agriculture Committee is moving ahead with its preparatory work for the next farm bill, due next year. The committee has two hearings scheduled for Congress' return this week: On Wednesday the full panel will review international food aid programs, and the next day its nutrition subcommittee will look at modernizing the Supplemental Nutrition Assistance Program, which Trump's budget proposal targeted for major cuts. — *Jenny Hopkinson*

DEFENSE

A packed defense calendar: Congress returns from recess with a lengthy defense to-do list.

The House and Senate Armed Services Committees are expected to begin moving their versions of the annual National Defense Authorization Act in late June. But with both chambers facing tight legislative schedules, lawmakers will be hard pressed to approve their bills and for a joint-House-Senate conference committee to hammer out the differences before the August recess.

Similarly, appropriators in the House and Senate are expected to begin work on their separate defense spending measures, but are unlikely to agree on final legislation before the summer break.

Still no spending topline: One key hurdle both authorizers and appropriators face is the overall level of national defense spending.

Trump has proposed $603 billion for the new 2018 fiscal year, beginning Oct. 1, including the base Pentagon budget and national security programs under the Energy Department. But defense hawks on Capitol Hill, including House and Senate Armed Services Chairmen Rep. Mac Thornberry (R-Texas) and Sen. John McCain (R-Ariz.), have criticized that level as insufficient to sustain a major military buildup and instead have proposed $640 billion.

House Defense Appropriations Subcommittee Chairwoman Kay Granger (R-Texas), however, calls the $640 billion topline "a high bar."

And the slow pace for Pentagon nominees drags on: The Senate has confirmed a handful of senior defense nominees, but the ranks of Senate-confirmed officials at the Pentagon remain thin.

Boeing executive Patrick Shanahan was announced as deputy defense secretary in March, but his nomination still hasn't been formally sent to the Senate. And two of the military services are still without civilian secretaries. Only Air Force Secretary Heather

Wilson has been confirmed. Trump's second pick for Army secretary, Tennessee state Sen. Mark Green, has withdrawn. And the president on Friday tapped financier Richard Spencer to be Navy secretary. — *Connor O'Brien*

EDUCATION

DeVos sells Trump budget priorities: Education Secretary Betsy DeVos continues her effort to sell the administration's proposed budget, which includes a 13-percent cut to education spending while making an unprecedented investment in school choice, including expanding charter schools and publicly funded private school options. DeVos is scheduled to testify Tuesday before a Senate appropriations subcommittee on Labor, Health and Human Services, Education and related agencies.

A decision on defense to repayment: The Obama administration proposed new standards for debt relief when students are defrauded by their college, and those "borrower defense to repayment rules" are slated to take effect on July 1 — but they could be delayed or scrapped this month. DeVos told lawmakers last month that the rules are "something that we are studying carefully and looking at and we will have something further to say on that within the next few weeks."

Charter schools gathering: The National Alliance for Public Charter Schools is having its annual summit in D.C. this month, which is sure to attract a lot of Hill folk and possibly administration officials. Netflix CEO Reed Hastings is set to deliver a keynote address. — *Ben Wermund*

ENERGY

Adieu, or Au Revoir? Trump officially announced he would start the process to officially pull the United States out of the Paris climate change agreement, but he left open an invitation to negotiate a replacement to "see if we can make a deal that's fair." Angry European leaders have rejected reopening the discussions among the 195 nations that signed the deal, and greens are skeptical the offer is real, since Trump easily could have reduced the U.S. commitment under the deal rather than seeking to leave it. But whether there will be any back-channel discussions or other efforts to alter the White House's decision remains to be seen. The withdrawal process is long and won't be completed until November 2020 — shortly after the next presidential election.

Energy nominees primed for action: Trump's picks for the Federal Energy Regulatory Commission and the departments of Energy and Interior are expected to get the endorsement of the Senate Energy and Natural Resources Committee shortly after lawmakers get back to Washington this week. FERC for months has had a lack of quorum, preventing it from green-lighting major natural gas projects or finalizing new

electricity policies. Expect Senate Majority Mitch McConnell to move Neil Chatterjee's and Rob Powelson's nominations as FERC commissioners to the floor quickly so the agency can deal with its backlog. Sen. Lisa Murkowski also said her committee would swiftly vote on DOE and DOI deputy nominees Dan Brouillette and David Bernhardt. However, the Senate is still waiting for the Trump administration to send a trio of nominees for the Nuclear Regulatory Commission. That agency's chairwoman, Kristine Svinicki, sees her term expire June 30. — *Matt Daily and Darius Dixon*

HEALTH CARE

Pharma waits on the Supreme Court: The justices are expected to issue rulings this month in a pair of cases the pharmaceutical industry is closely watching. One case, *Amgen v. Sandoz*, will help settle a long-running dispute on how quickly drug makers could bring to market cheaper copycat versions of expensive biologics. The second case, *Bristol Myers Squibb v. Superior Court of California*, could limit where patients sue drug makers for harm caused by their products.

Health insurers face key Obamacare deadline: Insurers worried about the GOP's Obamacare replacement plan have until June 21 to file proposed 2018 rates with the federal government. Some major and regional insurers, citing major uncertainty about the repeal effort, have already announced their withdrawal from the individual insurance market in 2018. Other insurers are seeking higher rate hikes to gird themselves against potential chaos in the Obamacare marketplaces. Meanwhile, insurers are still pleading with the Trump administration and Congress to save a key Obamacare subsidy that Trump has repeatedly threatened to scrap. — *Jason Millman*

EMPLOYMENT & IMMIGRATION

Labor Secretary Alexander Acosta has until the end of June to inform an appeals court whether he will defend the Obama administration's overtime rule. The regulation, issued last year, doubled (to $47,476) the salary threshold under which virtually all workers are guaranteed time-and-a-half pay if they work more than 40 hours in a given week. Originally set to take effect in December, the rule was blocked in late November by a preliminary injunction from a district court judge in Texas. The Obama administration immediately appealed that decision, raising the question of whether the Trump administration would continue the appeal. DOL, which lacked a new Labor secretary until April 27, twice requested additional time to file a reply brief, most recently in April. The new deadline is June 30.

It seems unlikely that Trump favors keeping the overtime rule, given his sweeping use of the Congressional Review Act to veto no fewer than 14 regulations issued late in the Obama administration. And Trump's on record saying he'd like to scale the rule back for

small businesses. Acosta also seems not to favor the rule. At his confirmation hearing, he questioned DOL's authority to raise the salary threshold to as high as $47,476, echoing language in the November injunction. The likeliest course is that Acosta will drop the legal challenge, then start fashioning a new overtime rule that raises the threshold closer to $33,000, a dollar figure he cited at the confirmation hearing as a truer inflation adjustment than $46,476. It all depends , of course, where the starting point lies. Implementation of such a rule would likely be years off. — *Marianne Levine*

TECHNOLOGY

Buckle up: Expect a bumpy ride in the FCC's seemingly never-ending net neutrality debate. Chairman Ajit Pai has proposed rolling back the agency's Open Internet order from the Obama administration, kicking off a lengthy public comment period. The number of comments in the proceeding has surged — to roughly 3 million, at last count — due in part to a fiery pro-net neutrality segment from HBO host John Oliver.

About those comments: The flood of comments has also generated allegations of foul play. Some reports indicate bots have been flooding the FCC's comment site with anti-net neutrality comments, while the FCC says the historically creaky site has been subject to a distributed denial-of-service attack. Net neutrality activists have expressed skepticism about that claim and asked the FCC to provide proof, and a group of Democratic senators has asked the FBI to brief them on the alleged cyberattack. The prolonged period of public comment is giving both sides in the debate — big internet service providers and conservative groups on the one hand, and digital activists, Democrats and some tech companies on the other — a chance to marshal their arguments and lobbying campaigns. So expect the issue to inflame passions for months, with the FCC expected to vote on the final order sometime in the fall. — *Eric Engleman*

TRADE

Sugar sanctions loom: Today is the day for Mexico to reach a new agreement with the United States if it wants to keep U.S. tariffs on sugar imports suspended. If no deal can be reached, Commerce Secretary Wilbur Ross has vowed to impose the duties, which had been set at up to 80 percent. Late Friday, the head of Mexico's sugar industry said that there was a "good chance" the two countries would come to a deal today. Such retaliation, if it comes to fruition, would set a negative tone with Mexico ahead of what is expected to be a contentious renegotiation of NAFTA.

And speaking of NAFTA: Public comments on NAFTA's negotiating objectives are due by June 12 and the U.S. Trade Representative's office will hold a June 27 public hearing on the upcoming trade talks.

Sizing up the deficit: The Commerce Department and the USTR office have until June 30 to release an analysis on the trade deficit. Trump set that deadline in a March 31 executive order and Ross has said the department is working to finish the report earlier than the scheduled completion date.

Import inquiries: The Commerce Department will hold a June 22 public hearing on its investigation into whether aluminum imports are a threat to national security. Public comments on that case are due June 29, and Commerce has said it will conclude that inquiry and a similar one on steel imports by the end of the month.

Oh, Canada: The nation will get hit with a U.S. trade action as the Commerce Department is expected to issue preliminary anti-dumping duties on June 23 on U.S. imports of lumber from Canada. The department set preliminary countervailing duties in that case in April. — *Adam Behsudi*

TRANSPORTATION

Another kind of dual tracking: If the anticipated timelines hold, this should be a consequential month in transportation as the administration and Congress ramp up their efforts on both an infrastructure package and a bill to reauthorize the FAA.

FAA: The White house is expected to propose today a new nonprofit, non-governmental entity to control the nation's air traffic control system, hewing to a non-governmental structure that will mean lower fees than "the patchwork combination of aviation taxes paid today," according to a document of principles obtained by POLITICO. Meanwhile the House is expected to roll out its version of an FAA reauthorization as soon as this month. The House Transportation Committee has held hearings and stakeholder meetings. And although members and aides will likely be haggling over details for some time, a plan could be rolled out quickly, especially with the shot in the arm it's gotten from the White House. Committee Chairman Bill Shuster (R-Pa.) is hoping to sit down and talk about it with Trump this week.

Infrastructure: The White House fiscal 2018 budget request contained some broad-brush goals for Trump's big infrastructure plan, but some were left wondering if that was what DOT Secretary Elaine Chao has been promising since she assumed her post. POLITICO has learned that the White House is anticipating releasing even more details this month. Stay tuned. — *Kathryn A. Wolfe*

DATAPOINT

Consumer confidence continues its retreat from March high: New data from the

Conference Board show consumer confidence fell 1.5 points to 117.9 in May, continuing a slight decline from a 16-year high in March. The survey reflects consumer perceptions and outlook on income levels, job availability and business conditions. The survey shows fewer consumers believe business conditions will improve and fewer consumers are optimistic about job availability over the next six months. Both younger and higher-income consumers are more optimistic in outlook than both older and lower-income consumers.

View the full graphic here and more from DataPoint on Pro.

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Chief of Staff

U.S. Environmental Protection Agency

Ex. 6 - Personal Privacy

6560-50-P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 320

[EPA-HQ-SFUND-2015-0781; FRL-9971-50-OLEM]

RIN 2050-AG61

Financial Responsibility Requirements under CERCLA Section 108(b) for Classes of Facilities in the Hardrock Mining Industry

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: The Environmental Protection Agency (EPA or Agency) is announcing its decision on its proposed regulations for financial responsibility requirements applicable to hardrock mining facilities that were published on January 11, 2017. EPA has decided not to issue final regulations because the Agency has determined that final regulations are not appropriate. This decision is based on EPA's interpretation of the statute and analysis of its record developed for this rulemaking. EPA has analyzed the need for financial responsibility based on risk of taxpayer funded cleanups at hardrock mining facilities operating under modern management practices and modern environmental regulations, i.e., the type of facilities to which financial responsibility regulations would apply. That risk is identified by examining the management of hazardous substances at such facilities, as well as by examining federal and state regulatory controls on that management and federal and state financial responsibility requirements. With that focus, the record demonstrates that, in the context of CERCLA section 108(b), the degree and duration of risk associated with the modern production, transportation,

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treatment, storage or disposal of hazardous substances by the hardrock mining industry does not present a level of risk of taxpayer funded response actions that warrant imposition of financial responsibility requirements for this sector. This determination reflects EPA's interpretation of the statute, EPA's evaluation of the record for the proposed rule, and the public comment received by EPA.

The decision not to issue final regulations will address the concerns of those federal and state regulators and members of the regulated community who commented that the proposed requirements were unnecessary and would, therefore, impose an undue burden on the regulated community. This decision will provide assurance to state regulators who were concerned that the proposed requirements would be disruptive of state mining programs. This decision also will address the information provided by the insurance industry regarding the lack of availability of financial instruments that meet the requirements of section 108(c)(2). This decision is based on the record for this rulemaking, and does not affect the process for site-specific risk determinations, or determinations of the need for a particular CERCLA response, at individual sites, nor does this decision affect EPA's authority to take appropriate CERCLA response actions. Decisions on risk under other environmental statutes would continue under those statutes. This final rule is the Agency's final action on the proposed rule.

DATES: This final rule is effective on **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**

ADDRESSES: EPA has established a docket for this action under Docket ID No. EPA-HQ-SFUND-2015-0781. All documents in the docket are listed on the https://www.regulations.gov web site. Although listed in the index, some information is not publicly available, e.g., Confidential Business Information (CBI) or other information whose disclosure is restricted by

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statute. Certain other material, such as copyrighted material, is not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available electronically through https://www.regulations.gov.

FOR FURTHER INFORMATION CONTACT: Office of Resource Conservation and Recovery, Mail Code 5303P, Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, Washington, DC 20460; Barbara Foster, (703) 308-7057, Foster.Barbara@epa.gov; or Michael Pease, (703) 308-0008, Pease.Michael@epa.gov.

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I. Executive Summary

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A. Purpose of the Regulatory Action

Section 108(b) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund, directs EPA to develop regulations that require classes of facilities to establish and maintain evidence of financial responsibility consistent with the degree and duration of risk associated with the production, transportation, treatment, storage, or disposal of hazardous substances. The statute further requires that the level of financial responsibility be established to protect against the level of risk the President, in his discretion, believes is appropriate, based on factors including the payment experience of the Fund. The President's authority under this section for non-transportation-related facilities has been delegated to the EPA Administrator.[1]

In a *Federal Register* notice dated July 28, 2009,[2] EPA identified the classes of facilities within hardrock mining[3] as the classes for which it would first develop financial responsibility requirements based on consideration of many factors, including factors unrelated to modern facilities, such as legacy contamination, and factors not demonstrating risk, in and of themselves, such as Toxic Release Inventory (TRI) reports under Superfund Amendments and Reauthorization Act of 1986 (SARA) section 313.

On January 11, 2017, the Agency published proposed financial responsibility requirements applicable to hardrock mining facilities. The proposal identified two goals for section 108(b) regulations – the goal of providing funds to address CERCLA liabilities at sites,

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[1] See EO 12580, 52 FR 2923 (January. 23, 1987).

[2] Identification of Priority Classes of Facilities for Development of CERCLA Section 108(b) Financial Responsibility Requirements, 74 FR 37213, July 28, 2009.

[3] For purposes of this final rule, EPA includes within the term "hardrock mining" the facilities included in the definition of that term developed for purposes of the *Priority Notice*, that is, facilities that extract, beneficiate, or process metals (e.g., copper, gold, iron, lead, magnesium, molybdenum, silver, uranium, and zinc), and non-metallic non-fuel minerals (e.g., asbestos, gypsum, phosphate rock, and sulfur).

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and the goal of creating incentives for sound practices that will minimize the likelihood of need for a future CERCLA response. As discussed below, EPA now believes that these goals have been met for the hardrock mining classes of facilities.

The proposal identified for public comment a range of options and supporting information, as described in the proposed rule preamble.[4] The proposed rule set forth, in proposed 40 CFR Part 320 subparts A through C, requirements for a comprehensive financial responsibility program under section 108(b) that would be applicable to hardrock mining facilities as well as to future industry sectors for which requirements under section 108(b) are later developed. In addition, the proposed rule set forth, in proposed Part 320 subpart H, requirements specifically applicable to hardrock mining facilities.

EPA provided information and analysis demonstrating releases and potential releases of hazardous substances at hardrock mining facilities. EPA also discussed the relationship of section 108(b) to other federal law and to state law.[5] However, despite making a commitment to do so in the 2009 Priority Notice, in the development of the proposed rule the Agency did not consider other federal and state programs when determining the need for section 108(b) regulations.[6] Instead, the proposed rule would have considered other programs only after financial responsibility requirements are imposed, as a means to reduce such requirements. EPA now believes that it is appropriate to consider such programs at the outset, when evaluating both the degree and duration of risk associated with the production, transportation, treatment, storage, or disposal of hazardous substances as well as when evaluating the risk of taxpayer financed response costs.

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[4] See 82 FR 3388, January 11, 2017.
[5] 82 FR 3402-03 (concluding that section 108(b) applies even when a facility is subject to financial responsibility requirements under federal law).
[6] 74 FR 37219 and n. 50.

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EPA's final action on the proposed rule is a decision not to promulgate it. As explained below, EPA has reconsidered whether the rulemaking record supports the proposed rule in light of the Agency's interpretation of the statute, the Agency's evaluation of the record, and the information and data received through public comment. As a result of this reconsideration, EPA has determined that the rulemaking record it assembled does not support imposing financial responsibility requirements under section 108(b) on current hardrock mining operations. This determination is based on information in the record on the degree and duration of risk posed by modern production, transportation, treatment, storage or disposal of hazardous substances at mining sites operating under modern regulations that demonstrates that financial responsibility requirements are not necessary to address the risk of taxpayer financed response actions at hardrock mines. EPA has reconsidered its assessment of the risks posed by hardrock mining operations presented in the proposed rule, and determined that that assessment did not adequately consider the degree to which existing federal and state regulatory programs and improved mining practices at modern mines reduce the risk that there would be unfunded response liabilities at currently operating mines. Furthermore, EPA notes that even under the analysis in the proposed rule, the projected level of risk of EPA-funded response actions was relatively low ($15 to $15.5 million per year), and was significantly less than the projected cost to industry of providing the additional financial responsibility that would have been required by the proposed rule ($111 – $171 million per year).

The Agency's decision that a section 108(b) rule for the hardrock mining industry is not appropriate relies on the record developed for this rulemaking as well as information submitted by commenters on three key points, which in combination demonstrate significantly reduced risk at current hardrock mining operations: (1) the reduction in risks due to the requirements of

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existing federal and state mining programs and voluntary protective practices of current hardrock mining owners and operators, (2) the reduced costs to the taxpayer resulting from effective hardrock mining programs, enforcement actions, and owner or operator responses, including financial assurance requirements pursuant to these other programs, and (3) the resulting reduction in the risk of the need for federally financed response actions at hardrock mines. The record thus evaluated also supports EPA's determination that federal and state regulation and practices at modern facilities reduce the risks posed by operating facilities and, therefore, the imposition of section 108(b) financial responsibility requirements is not appropriate.

This determination also addresses concerns regarding disruption and duplication of state and federal financial responsibility requirements, the difficulty in tailoring financial responsibility to a specific level of risk, as well as concerns raised by the financial industry regarding challenges in providing financial instruments that meet the requirements of the statute and the proposed rule. As discussed below, the proposed rule created the potential for the preemption of state financial responsibility requirements. In addition, EPA acknowledges that the formula through which EPA had proposed to determine the level of financial assurance relied on information unrelated to risks of taxpayer financed costs posed by the current facilities to which the proposed rule would apply. Finally, as discussed below, members of the financial industry commented that section 108(c)(2), which allows direct claims against a guarantor providing evidence of financial responsibility, is at odds with relevant commercial law and practice and would significantly deter the financial industry from providing such instruments and services.

This final rule does not affect, limit, or restrict EPA's authority to take a response action or enforcement action under CERCLA at any individual hardrock mining facility, including the

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currently operating facilities described elsewhere in this final rule and in the Technical Support Document for this final rule,[7] and to include requirements for financial responsibility as part of such response action. The set of facts in the rulemaking record related to the individual facilities discussed in this final rule support the Agency's decision not to issue financial responsibility requirements under section 108(b) for currently operating hardrock mining facilities as a class, but a different set of facts could demonstrate a need for a CERCLA response at those sites. This final rule also does not affect the Agency's authority under other authorities that may apply at hardrock mining facilities, such as the Clean Water Act (CWA), the Resource Conservation and Recovery Act (RCRA), the Clean Air Act (CAA), and the National Environmental Policy Act (NEPA).

B. Summary of the Major Provisions of the Regulatory Action

EPA is not requiring evidence of financial responsibility under section 108(b) at hardrock mining facilities in this action. Thus, there are no regulatory provisions associated with this final action.

C. Costs and Benefits of the Regulatory Action

The Regulatory Impact Analysis for the proposed rule demonstrated that the projected level of taxpayer liability that would have been avoided by the proposed rule was relatively small, and that the costs of meeting the proposed financial responsibility requirements were an order of magnitude greater than the costs avoided by the federal government as a result of such requirements. EPA is not requiring evidence of financial responsibility under section 108(b) at hardrock mining facilities in this action. EPA therefore has not conducted a Regulatory Impact Analysis for this action.

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7 See: EPA, "CERCLA Section 108(b) Hardrock Mining Final Rule Technical Support Document," December 1, 2017.

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II. Authority

This final rule is issued under the authority of sections 101, 104, 108 and 115 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C §§ 9601, 9604, 9608 and 9615, and Executive Order 12580. 52 FR 2923, 3 CFR, 1987 Comp., p. 193.

III. Background Information

A. Overview of Section 108(b) and other CERCLA Provisions

CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), establishes a comprehensive environmental response and cleanup program. Generally, CERCLA authorizes EPA[8] to undertake removal or remedial actions in response to any release or threatened release into the environment of "hazardous substances" or, in some circumstances, any other "pollutant or contaminant." As defined in CERCLA section 101, removal actions include actions to "prevent, minimize, or mitigate damage to the public health or welfare or to the environment," and remedial actions are "actions consistent with [a] permanent remedy[.]" Remedial and removal actions are jointly referred to as "response actions." CERCLA section 111 authorizes the use of the Superfund Trust Fund (the Fund) established under title 26, United States Code, including financing response actions undertaken by EPA. In addition, CERCLA section 106 gives EPA[9] authority to compel action by liable parties in response to a release or

[8] Although Congress conferred the authority for administering CERCLA on the President, most of that authority has since been delegated to EPA. *See* Exec. Order No. 12580, 52 Fed. Reg. 2923 (Jan. 23, 1987). The executive order also delegates to other federal agencies specified CERCLA response authorities at certain facilities under their "jurisdiction, custody or control." This can include CERCLA authorities at mines located on federal lands under the jurisdiction of BLM and the Forest Service.

[9] CERCLA sections 106 and 122 authority is also delegated to other federal agencies in certain circumstances. *See* Exec. Order No. 13016, 61 FR 45871 (Aug. 28, 1996).

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threatened release of a hazardous substance that may pose an "imminent and substantial endangerment" to public health or welfare or the environment.

CERCLA section 107 imposes liability for response costs on a variety of parties, including certain past owners and operators, current owners and operators, and certain transporters of hazardous substances. Such parties are liable for any costs of removal or remedial action incurred by the federal government, so long as the costs incurred are "not inconsistent with the national contingency plan," (NCP).[10] Section 107 also imposes liability for natural resource damages and health assessment costs.[11] As has been the case since CERCLA's enactment, these provisions of CERCLA are available according to their terms, to the federal government and other parties, regardless of whether an owner or operator has provided evidence of financial responsibility under section 108(b).

In accordance with CERCLA, in 1990 EPA issued the current version of the NCP.[12] These regulations provide the organizational structure and procedures for preparing for, and responding to, discharges of oil and releases of hazardous substances, pollutants, and contaminants. The NCP is codified at 40 CFR Part 300. Among other provisions, the NCP provides procedures for hazardous substance response including site evaluation, removal actions, remedial investigation/feasibility studies (RI/FS), remedy selection, remedial design/remedial action (RD/RA), and operation and maintenance.[13] The NCP also designates federal, state, and tribal trustees for natural resource damages, and identifies their responsibilities under the NCP.[14] Under the NCP, EPA undertakes response actions that address or prevent risk to human health

[10] See CERCLA § 107 (a)(4)(A).
[11] See CERCLA § 107 (a)(4)(C) – (D).
[12] See 55 FR 8666, March 8, 1990.
[13] See 40 CFR 300, Subpart E.
[14] See 40 CFR 300, Subpart G.

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and the environment from the release of hazardous substances, pollutants or contaminants. A determination whether a release of hazardous substances, pollutants or contaminants presents a risk to be addressed under other sections of CERCLA or under other law is a separate determination from whether under section 108(b) risk associated with the management of hazardous substances at current hardrock mining operations warrants imposition of financial responsibility requirements. Nothing in this final action restricts EPA's other authorities. The Agency's decision not to issue final regulations under section 108(b) applicable to hardrock mining facilities does not change or substitute for EPA's procedures for site-specific evaluations of risk, and for determining the need for response, in accordance with the NCP.

Section 108(b) establishes an authority to require owners and operators of classes of facilities to establish and maintain evidence of financial responsibility. Section 108(b)(1) directs EPA to develop regulations requiring owners and operators of facilities (in addition to those under Subtitle C of the Solid Waste Disposal Act and other federal law) to establish evidence of financial responsibility "consistent with the degree and duration of risk associated with the production, transportation, treatment, storage, or disposal of hazardous substances." In turn, section 108(b)(2) directs that the level of financial responsibility shall be initially established, and, when necessary, adjusted to protect against the level of risk that EPA in its discretion believes is appropriate based on the payment experience of the Fund, commercial insurers, courts settlements and judgments, and voluntary claims satisfaction. Section 108(b)(2) does not, however, preclude EPA from considering other factors in addition. The statute prohibited promulgation of such regulations before December 1985.

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In addition, section 108(b)(1) provides for publication within three years of the date of enactment of CERCLA of a "priority notice" identifying the classes of facilities for which EPA would first develop financial responsibility requirements. It also directs that priority in the development of requirements shall be accorded to those classes of facilities, owners, and operators that present the highest level of risk of injury.

B. History of this Rulemaking

In November 2003, EPA initiated a study of the Superfund program, commonly referred to as the "120 Day Study."[15] This "120 Day Study" resulted in more than 100 recommendations. In 2005, EPA initiated an Action Plan for implementing the recommendations of the 120-Day Study of the Superfund Program. Under that plan, EPA conducted an analysis to determine whether action under section 108(b) was appropriate (Recommendation 12). This analysis resulted in two detailed studies specifically designed to help identify classes of facilities for priority consideration under section 108(b), carried out from 2006 through 2008. The report of these studies, labeled "draft" and dated February 2009, are titled: "CERCLA 108(b) Financial Responsibility, Phase 1: Preliminary Analysis" (hereinafter Phase 1 Report) and "CERCLA 108(b) Financial Responsibility, Phase 2 Preliminary Analysis" (hereinafter Phase 2 Report).[16] Another analysis,[17] referred to as the 40 TSD Study, also recommended by the 120-Day Study (Recommendations 10 and 11), on the sufficiency of financial assurance requirements imposed on hazardous waste treatment, storage, and disposal (TSD) facilities regulated under RCRA also provides relevant information.

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[15] See *Superfund: Building on the Past, Looking to the Future* (Washington DC: April 22, 2004), EPA-HQ-SFUND-2015-0781-0501.

[16] EPA-HQ-SFUND-2009-0265-0019 and EPA-HQ-SFUND-2009-0265-0020.

[17] See "Analysis of 40 Potential TSDs: Potential RCRA Treatment, Storage, and Disposal Facilities Proposed to the Superfund National Priority List after 1990," Office of Solid Waste, January 19, 2007

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In the Phase 1 and Phase 2 analyses, EPA interpreted the financial responsibility requirements of section 108(b) to apply to currently operating facilities and current or future risks. Accordingly, in the analyses performed from 2006 through 2008, the Agency attempted to exclude historic practices and legacy contamination resulting from such practices by using 1990 as a date to distinguish between modern and legacy practices. The Agency stated that it used 1990 because by that date most of the regulations under RCRA relating to management of hazardous waste had been promulgated. This approach was consistent with the 40 TSD study, which excluded facilities proposed to the National Priorities List (NPL) before 1990 to exclude facilities with legacy contamination that predated the RCRA hazardous waste regulatory program. However, because EPA determined in 1986 under section 3001(b)(3)(C) of RCRA that solid waste from the extraction and beneficiation of ores and minerals do not present sufficient risk to warrant regulation under subtitle C of RCRA,[18] 1990 is not a precise date for the advent of modern regulation of mining. As discussed below, commenters noted that state and federal mining regulations developed over a period of time. For mining regulated under state law, commenters suggest the mid-1990s represent the advent of modern mining regulation.[19]

In 2009, the Agency changed its interpretation of the statute. A July 2, 2009, memorandum attached to the Phase 1 and Phase 2 reports states that EPA decided that the reports were deficient because they excluded sites listed on the NPL before 1990. Accordingly, EPA did not finalize the reports and did not proceed to an analysis of the federal and state regulatory requirements and the modern practices of any specific industry sector.[20] Instead, in a *Federal*

[18] 51 FR 24496 (July 3, 1986).
[19] State mining laws are discussed below.
[20] EPA-HQ-SFUND-2009-0265-0019 and EPA-HQ-SFUND-0265-0020.

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Register notice dated July 28, 2009,[21] EPA identified certain classes of facilities within the hardrock mining sector as the classes for which it would first develop financial responsibility requirements. EPA based that identification on consideration of many factors, including factors unrelated to risk posed by the production, transportation, treatment, storage, and disposal of hazardous substances at facilities that would be regulated under the proposed rule, such as legacy contamination, and non-risk based information, such as Toxic Release Inventory reports under SARA section 313. This notice represented a substantial departure from previous EPA interpretation of the statute to exclude legacy activities when determining the need for financial responsibility requirements under section 108(b).[22]

In the 2009 Priority Notice, EPA identified hardrock mining facilities as a priority without considering the impacts of modern federal and state regulations. Instead, EPA stated: "EPA will carefully examine specific activities, processes, and/or metals and minerals in order to determine what proposed financial responsibility requirements may be appropriate. As part of this process, EPA will conduct a close examination and review of existing Federal and State authorities, policies, and practices that currently focus on hardrock mining activities."[23]

On January 11, 2017, the Agency published proposed financial responsibility requirements applicable to hardrock mining facilities.[24] The proposed rule adopted two goals for section 108(b) regulations -- to provide funds to address CERCLA liabilities at sites, and to create incentives for sound practices that will minimize the likelihood of need for a future CERCLA response.

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[21] Identification of Priority Classes of Facilities for Development of CERCLA Section 108(b) Financial Responsibility Requirements, 74 FR 37213, July 28, 2009.
[22] Compare EPA's Phase I and Phase II reports (EPA-HQ-SFUND-2009-0265-0019 and EPA-HQ-SFUND-0265-0020) to 74 FR 37213.
[23] 74 FR 37219.
[24] 82 FR 3388 (January 11, 2017).

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The proposal identified for public comment a range of options and supporting information, as described in the proposed rule preamble. The proposed rule set forth, in proposed Part 320 subparts A through C, requirements for a comprehensive financial responsibility program under section 108(b) that would be applicable to hardrock mining facilities, as well as to future industry sectors for which requirements under section 108(b) are later developed. In addition, the proposed rule set forth, in proposed Part 320 subpart H, requirements specifically applicable to hardrock mining facilities.

The proposed rule provided information and analyses on releases and potential releases of hazardous substances at hardrock mining facilities. The proposed rule identified several classes of hardrock mining facilities that were excluded from the financial responsibility requirements because they involved a lower risk, and sought comment on whether additional classes should be excluded from the scope of a final rule.[25] The proposed rule also discussed the relationship of section 108(b) to other federal law and to state law.[26] However, contrary to the commitment made in the 2009 Priority Notice, the proposed rule did not consider reductions in risk as a result of such laws when determining the need for financial responsibility requirements. Instead, the proposed rule would have established such requirements at a level based on the activities already covered by reclamation bonds as well as the cost of cleaning up historic mining sites and then, based on information provided by the facility, would have allowed reductions in the amount of financial responsibility,[27] or release from the requirement for financial responsibility entirely.[28]

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[25] 82 FR 3456-59; Hoffman Memo, "Mining Classes Not Included in Identified Classes of Hardrock Mining," June 2009. See 82 FR 3455 n. 145. See exclusions from the rule at proposed 40 CFR 320.60(a)(2). EPA solicited comments on whether to identify additional exclusions based on a finding of minimal risk, citing iron ore, phosphates and uranium mines as examples. 82 FR 3456.
[26] 82 FR 3402-03.
[27] Proposed 40 CFR 320.63.
[28] Proposed 40 CFR 320.27.

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EPA received over 11,000 public comment submissions on the proposed rule. Other federal agencies, state agencies, and industry representatives overwhelmingly opposed financial responsibility requirements under section 108(b) for the hardrock mining industry. Environmental groups urged adoption of the proposed rule. EPA also received a large number of identical comments from individuals through multiple letter-writing campaigns, advocating both for and against adoption of the rule. Among other concerns, commenters objecting to the proposed rule expressed the view that the Agency's assessment of the information relating to risks posed by hardrock mining operations as presented in the proposed rule was deficient because the Agency: (1) relied on inappropriate evidence, such as data that did not demonstrate risk, and evidence not relevant to the facilities to be regulated under the rule; and (2) failed to consider relevant evidence, such as the role of federal and state mining programs and voluntary protective mining practices in reducing risks at current[29] hardrock mining operations, and the reduced costs to the taxpayer resulting from effective hardrock mining programs, including existing financial responsibility requirements, and owner or operator responses.

EPA has considerable discretion under the statute and, as explained below, has reconsidered whether the rulemaking record supports the proposed rule in light of EPA's interpretation of the statute, review of the record, and the information and data received through public comment. As a result, EPA has determined that the assessment of the information relating to risks posed by hardrock mining operations as presented in the proposed rule was not supported by the record. This reassessment relies on the information in the record on three key points: (1) the reduction in risks due to the requirements of existing federal and state mining programs and protective practices of current hardrock mining owners and operators, (2) the reduced costs to the

[29] A discussion of which mining operations are considered "current" or "modern" can be found in section IV.D.1. of this final rule.

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taxpayer resulting from effective hardrock mining programs, including existing financial responsibility requirements, and owner or operator responses, and (3) the resulting reduction in the risk of the need for federally financed response actions at hardrock mines.

C. Recent Litigation under Section 108(b)

On March 11, 2008, Sierra Club, Great Basin Resource Watch, Amigos Bravos, and Idaho Conservation League filed a suit against then EPA Administrator Steven Johnson and then Secretary of the U.S. Department of Transportation Mary E. Peters, in the U.S. District Court for the Northern District of California. Sierra Club, et al. v. Johnson, No. 08- 01409 (N. D. Cal.). On February 25, 2009, that court ordered EPA to publish the Priority Notice required by section 108(b)(1) later that year. The court later dismissed the remaining claims. [30]

EPA continued to work on a proposed rule for the next several years. However, developing a regulation that meets the statutory requirements presented a significant challenge.[31] Dissatisfied with the pace of EPA's progress, in August 2014, the Idaho Conservation League, Earthworks, Sierra Club, Amigos Bravos, Great Basin Resource Watch, and Communities for a Better Environment filed a new lawsuit in the U.S. Court of Appeals for the District of Columbia Circuit, seeking a writ of mandamus requiring issuance of section 108(b) financial responsibility rules for the hardrock mining industry and for three other industries -- chemical manufacturing; petroleum and coal products manufacturing; and electric power generation, transmission, and distribution.[32] Companies and organizations representing business interests in the hardrock mining and other sectors also sought to intervene in the case.

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[30] See *Sierra Club v. Johnson,* 2009 U.S. Dist. LEXIS 68436 (N.D. Cal. Aug. 5, 2009).

[31] See the discussion regarding instrument availability in section IV., and the discussions in section VII of some of the obstacles to developing a rule under section 108(b).

[32] In re: Idaho Conservation League, et al., No. 14-1149.

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Following oral argument, the court issued an Order in May 2015 requiring the parties to submit, among other things, supplemental submissions addressing a schedule for further administrative proceedings under section 108(b). The Court's May 19, 2015 Order encouraged the parties to confer regarding a schedule and, if possible, to submit a jointly agreed upon proposal. Petitioners and EPA agreed to a schedule calling for the Agency to sign for publication in the *Federal Register* a proposed rule for the hardrock mining industry by December 1, 2016, and a notice of its final action on the proposal by December 1, 2017. The parties submitted this schedule to the court, and on January 29, 2016, the court granted the parties' joint motion and issued an order that mirrored the submitted schedule in substance.[33] With this action the Agency has now satisfied both of these obligations.

D. Hardrock Mining Priority Notice

As described above, section 108(b)(1) requires the President to identify those classes of facilities for which requirements will be first developed and to publish notice of such identification in the *Federal Register*. On July 28, 2009, EPA issued a "Priority Notice" entitled "Identification of Priority Classes of Facilities for Development of Section 108(b) Financial Responsibility Requirements."[34] In the 2009 Priority Notice, EPA explained how it then chose to evaluate indicators of risk and its related effects, to inform its decision on the classes of facilities for which it would first develop requirements.[35] The 2009 Priority Notice pointed to eight factors that EPA considered,[36] and stated that its review of those factors and the associated

[33] In re Idaho Conservation League, 811 F.3d 502.
[34] See 74 FR 37213 (July 28, 2009).
[35] See Id. at 37214.
[36] These eight factors were: (1) annual amounts of hazardous substances released to the environment; (2) the number of facilities in active operation and production; (3) the physical size of the operation; (4) the extent of environmental contamination; (5) the number of sites on the CERCLA site inventory (including both NPL sites and

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information in the docket led the Agency to conclude that hardrock mining facilities present the type of risk that, in light of its evaluation, justified them being the first for which EPA would develop section 108(b) requirements.[37] The 2009 Priority Notice satisfied the notice requirement in section 108(b)(1).

E. Hardrock Mining Proposed Rule

On January 11, 2017, EPA proposed requirements in a new 40 CFR Part 320 that owners and operators of hardrock mining facilities subject to the rule demonstrate and maintain financial responsibility as specified in the proposed rule.

The proposed rule identified two goals for section 108(b) regulations – the goal of providing funds to address CERCLA liabilities at sites, and the goal of creating incentives for sound practices that will minimize the likelihood of need for a future CERCLA response. The proposed rule explained that first, when releases of hazardous substances occur, or when a threat of release of hazardous substances must be averted, a Superfund response action may be necessary. Therefore, the costs of such response actions can fall to the taxpayer if parties responsible for the release or potential release of hazardous substances are unable to assume the costs.[38] Second, the likelihood of a CERCLA response action being needed, as well as the costs of such a response action, are likely to be higher where protective management practices were not utilized during facility operations.[39]

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non-NPL sites); (6) government expenditures; (7) projected cleanup expenditures; and (8) corporate structure and bankruptcy potential (74 FR 37214, July 28, 2009).

[37] Id.

[38] The proposed rule discussion acknowledged the existence of federal and state financial responsibility requirements but took the position that they do not duplicate CERCLA financial responsibility requirements. 83 FR 3402. For example, the proposed rule claimed that state regulations include but are not limited to hazardous substance releases. 83 FR 3403.

[39] As discussed below, the Agency now believes that protective management practices must be considered when determining the need for financial responsibility requirements.

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The proposed rule discussed information assembled by EPA in the record for the action, which, as discussed below, included information on legacy practices and legacy contamination, as well as information not related to risk. Based on that record, EPA had proposed to presume that hardrock mining facilities as a class present the type of risks that section 108(b) addresses. The proposed rule then proceeded to establish a methodology to determine a level of financial responsibility in accordance with a proposed formula. The formula then allowed adjustments to the level of those requirements if a facility could demonstrate site specific conditions that rebut the presumption that the hardrock mining facilities that would be regulated under the rule pose a risk.[40]

EPA proposed limiting the applicability of the rule to owners and operators of facilities that are authorized to operate or should be authorized to operate on the effective date of the rule (hereinafter referred to as "current hardrock mining operations").[41] EPA explained its interpretation of the statute on this issue.[42] The proposed rule also relied, in part, on the grounds that these owners and operators are more likely to further the regulatory goals of section 108(b) requirements than are owners and operators of facilities that are closed or abandoned. EPA also proposed limiting the applicability of the rule to current hardrock mining operations because those facilities are readily identifiable and, since they are ongoing concerns, they are more likely to be able to obtain the kind of financial responsibility necessary under the regulation.[43] EPA continues to believe that this focus upon current hardrock mining operations is appropriate.

IV. Statutory and Record Support for this Final Rule

A. Statutory Interpretation

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[40] See proposed 40 CFR 320.63.
[41] See proposed 40 CFR 320.2.
[42] 82 FR 3404 – 05.
[43] The proposed rule also excluded 55 specific substances (see footnote 25 infra).

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Section 108(b) provides EPA only general instructions in paragraphs (b)(1) and (b)(2), on how to determine what financial responsibility requirements to impose for a particular class of facility. Section 108(b)(1) directs EPA to develop regulations requiring owners and operators of facilities to establish evidence of financial responsibility "consistent with the degree and duration of risk associated with the production, transportation, treatment, storage, or disposal of hazardous substances. Section 108(b)(2) directs that the level of financial responsibility shall be initially established, and, when necessary, adjusted to protect against the level of risk that EPA in its discretion believes is appropriate based on the payment experience of the Fund, commercial insurers, courts settlements and judgments, and voluntary claims satisfaction. Section 108(b)(2) does not indicate that this list of factors is exclusive. Read together, it is clear that the statutory language on determining the degree and duration of risk presented by a class, and in setting the level of financial responsibility as it determines is appropriate, confers a significant amount of discretion upon the Agency. EPA discusses these key phrases in turn below.

Section 108(b)(1) directs EPA to develop regulations requiring owners and operators of classes of facilities that EPA identifies, to establish evidence of financial responsibility "consistent with the degree and duration of risk associated with the production, transportation, treatment, storage, or disposal of hazardous substances." Thus, the statute indicates that EPA is to evaluate risk from a selected class. However, EPA does not interpret this direction to require a precise calculation of risk associated with the selected classes of facilities. Standard dictionary definitions of the term "consistent" include merely "being in agreement" or "compatible." [44] Moreover, section 108(b) requirements are necessarily imposed in the absence of any response action, although it is through such response actions that the precise level of risk associated with a

[44] 301 Webster's II New Riverside University Dictionary (1988).

particular site is ascertained. The statute thus confers upon EPA wide latitude to determine, for purposes of a section 108(b) rulemaking proceeding, what the degree and duration of risk presented by the identified class is. Section 108(b)(2) in turn directs that the level of financial responsibility shall be initially established, and, when necessary, adjusted to protect against the level of risk that EPA in its discretion believes is appropriate based on the payment experience of the Fund, commercial insurers, courts settlements and judgments, and voluntary claims satisfaction. This statutory direction does not specify a particular methodology for the evaluation, indicating simply that the level of financial responsibility be established to protect against the level of risk that EPA "in [its] discretion believes is appropriate." Thus, this decision is committed to the discretion of the Administrator. While the statute does provide a list of information sources in section 108(b)(2) on which EPA is to base its decision – the payment experience of the Superfund, courts settlements and judgments, and voluntary claims satisfaction – that list is not exclusive, nor does the statute specify how the information from these sources is to be used, for example, by indicating how the categories are to be weighted relative to one another. As discussed elsewhere in this final rule and in the Technical Support Document, the record and comments received by EPA, provide details about the payment history of the Fund, experience with enforcement actions and court settlements resulting in operational changes, and voluntary actions by companies to reduce risks at specific sites that were used by the Administrator in his judgement to evaluate the risks from current hardrock mining operations. EPA has, therefore, taken multiple considerations into account, including information in these categories which, taken together, inform the exercise of its statutory discretion.

Among the types of information the statute authorizes EPA to consider are the existence of federal and state regulations and financial responsibility requirements. Section 108(b)(1)

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directs EPA to promulgate financial responsibility requirements "for facilities in addition to those under subtitle C of the Solid Waste Disposal Act and other Federal law." According to the 1980 Senate Report on legislation that was later enacted as CERCLA, Congress felt it was appropriate for EPA to examine those additional requirements when evaluating the degree and duration of risk:

> The bill requires also that facilities maintain evidence of financial responsibility consistent with the degree and duration of risks associated with the production, transportation, treatment, storage, and disposal of hazardous substances. These requirements are in addition to the financial responsibility requirements promulgated under the authority of section 3004(6) of the Solid Waste Disposal Act. It is not the intention of the Committee that operators of facilities covered by section 3004(6) of that Act be subject to two financial responsibility requirements for the same dangers.[45]

While the report language addresses section 3004(6) of RCRA specifically, EPA believes that it is consistent with Congressional intent for EPA to consider other potentially duplicative Federal financial responsibility requirements when examining the "degree and duration of risk" or the "level of risk" when determining whether and what financial responsibility requirements are appropriate. EPA also believes that it is consistent with Congressional intent for EPA to consider state laws before imposing federal financial responsibility requirements on facilities. Consideration of state laws *before* developing financial responsibility regulations is consistent with section 114(d) of CERCLA, which prevents states from imposing financial responsibility requirements for liability for releases of the same hazardous substances *after* a facility is regulated under section 108 of CERCLA. Just as Congress clearly intended to prevent states from imposing duplicative financial assurance requirements after EPA had acted to impose such requirements under Section 108, EPA believes it reasonable to also conclude that Congress did

[45] S. Rept. 96-848 (2d Sess, 96th Cong.), at 92.

not mean for EPA to disrupt existing state programs that are already successfully regulating industrial operations to minimize risk, including the risk of taxpayer liability for response actions under CERCLA, and that specifically include appropriate financial assurance requirements under State law. Both reviews (of state and other Federal programs) help to identify whether and at what level there is current risk that is appropriate to address under section 108 of CERCLA.

EPA also believes that, when evaluating whether and at what level it is appropriate to require evidence of financial responsibility, EPA should examine information from hardrock mining facilities operating under modern conditions. These modern conditions include state and federal regulatory requirements and financial responsibility requirements that currently apply to operating facilities.

This reading of section 108(b) is consistent with statements in the legislative history of the statute. The 1980 Senate Report states that the legislative language that became section 108(b) "requires those engaged in businesses involving hazardous substances to maintain evidence of financial responsibility commensurate with the risk which they present."[46] This reading of section 108(b) is also supported by testimony given by EPA before Congress during consideration of legislation that led to CERCLA. In 1979, Thomas C. Jorling, the EPA Assistant Administrator for Water and Waste Management, testified before a Senate subcommittee that new financial responsibility requirements in a hazardous substance liability law would be important to increase "standards of care" with respect to management of such substances. Mr. Jorling testified that this goal is not "relevant" to sites where "it is already too late; emergency assistance and containment are required."[47] EPA notes that nothing in Mr. Jorling's testimony

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[46] S. Rept. 96-848 (2d Sess, 96th Cong.), at 92.

[47] *See* Statement of Thomas C. Jorling, Assistant Administrator for Water and Waste Management, USEPA regarding S.1341/S.1480 (Sen. Comm. on Env't and Public Works, Subcommittees on Resource Protection and Environmental Pollution, June 20, 1979).

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suggests that there are not other potential mechanisms, such as successful regulatory programs under state and other Federal laws, that can ensure appropriate "standards of care."

This statutory interpretation was also reflected in the proposed rule. The proposed rule would have applied to currently operating facilities.[48] As explained in the preamble to the proposal, EPA sought to document the extent to which hardrock mining facilities as a class continued to present risk associated with hazardous substance management.[49] Moreover, this direction to identify requirements "consistent with" the risks found also led EPA to recognize that imposition of financial responsibility requirements under section 108(b) would not be necessary for facilities that present minimal current risks[50] and to seek comment on whether other classes of facilities should be excluded.[51]

Despite its focus on currently operating facilities, the proposed rule relied on a record of releases of hazardous substances from facilities and payments to respond to such releases that does not present the same risk profile as the modern facilities to which the rule would apply.[52] As a result, EPA has determined that the analysis of risk presented in the proposed rule is inconsistent with the scope of the proposed rule and EPA's intended approach under the statute.

The final rule does not seek to rely on historical practices, many of which would be illegal under current environmental laws and regulations,[53] to identify the degree and duration of risk posed by the facilities that would be subject to financial responsibility requirements. Instead, in this final rule EPA has considered modern federal and state regulation of hazardous

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[48] See proposed 40 CFR 320.2 and 82 FR 3404-05.
[49] See 82 FR 3470 – 80.
[50] See exclusions from the rule at proposed 40 CFR 320(a)(2), as well as the opportunity to obtain a release from financial responsibility requirements at proposed 40 CFR 320.27. Both were proposed based on an evaluation of the level of risk posed by the facilities. 82 FR 3455-59.
[51] 82 FR 3456.
[52] 82 FR 3460-61.
[53] See, for example, Clean Water Act effluent limitations applicable to mining, discussed below.

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substance production, transportation, treatment, storage, or disposal at hardrock mining facilities. As discussed below, the record does not document significant risks associated with such facilities. Further, this final rule does not rely on the cost of responding to historic mining activities and instead reflects the reduction in the risk of federally financed response actions at modern hardrock mining facilities that result from modern practices and modern regulation. With a few exceptions, discussed below, EPA has made minimal expenditures for modern hardrock mining operations. In addition, EPA engaged in significant discussions with, and received significant comments from, commercial insurers and other financial instrument providers. These providers have submitted information indicating that the availability of financial responsibility instruments would likely be limited for regulated entities, should EPA require companies to obtain them. Thus, to the extent that risks remain at current hardrock mining operations, the information provided by commenters has further convinced EPA that it is not appropriate to establish financial responsibility requirements on this class of facilities.

Nor does EPA believe that issuing final financial responsibility requirements is necessary to achieve the stated goals of the proposed section 108(b) rules for hardrock mining, namely, the goal to increase the likelihood that regulated entities will provide funds necessary to address CERCLA liabilities if and when they arise, and the goal to create an incentive for sound practices. EPA's economic analysis showing that the proposed rule would avoid governmental costs of only $15 - $15.5 million a year supports this conclusion. Based on these estimates, commenters objected that the projected annualized costs to industry ($111 – $171 million) are an order of magnitude higher than the avoided costs to the government ($15 – 15.5 million) sought by the rule. Further, given the fact that federal and state laws, including potential liability under CERCLA, have already created an incentive for sound practices, promulgating financial

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responsibility regulations for hardrock mining facilities under section 108(b) also is not necessary to advance that goal.

This final rule is based on the record assembled for this action. This decision does not substitute for any site-specific determinations of risk made in the context of individual CERCLA site responses. Those decisions will continue to be made in accordance with preexisting procedures. EPA has reached these conclusions on the record for this rulemaking, including public comments.

The major concerns raised by commenters are described below in Sections C and D. Section E below, and the Technical Support Document for this final rule, discuss case examples in EPA's record that correspond to these major concerns. It should be noted that much of the public comment received on the proposed rule addressed specific provisions of the proposal. Because EPA has decided not to issue regulatory text under section 108(b) for hardrock mining facilities, or the general provisions in proposed subparts A through C, comments on specific regulatory provisions are outside the scope of this final rule.

B. Evaluation of the Administrative Record

EPA has reevaluated the administrative record for this rulemaking regarding risk at current hardrock mining operations in light of its interpretation of the statute discussed above, and has determined that that record does not support the proposed rule and supports, instead, a final Agency action of no rule. This determination is based on an evaluation of the three primary reports that the proposed rule relied on to identify risk to be addressed by section 108(b): Evidence of CERCLA Hazardous Substances and Potential Exposures at Section 108(b) Mining and Mineral Processing Sites (hereinafter referred to as the "Evidence Report"); Releases from Hardrock Mining Facilities (hereinafter referred to as the "Releases Report"); and

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Comprehensive Report: An Overview of Practices at Hardrock Mining and Mineral Processing Facilities and Related Releases of CERCLA Hazardous Substances (hereinafter referred to as the "Practices Report").[54] This determination also is based on EPA's consideration of the reduction of risk as a result of federal and state regulatory and financial assurance requirements. Finally, this determination is based on the record of payments from the Superfund Trust Fund to address hazardous substance releases from modern mining facilities.

1. Reports on Risks posed by Hardrock Mining Facilities

Evidence Report

As described in the preamble to the proposed rule, the Evidence Report documents EPA's preliminary efforts from 2009–2012 to examine CERCLA site-specific documents for estimated exposures of human and ecological receptors to CERCLA hazardous substances from mining and mineral processing sites cleaned up under Superfund in the past. This report also collected available information on potential exposures of human and ecological receptors to CERCLA hazardous substances from mining and mineral processing sites that were operational in 2009 (the most current available data at the time the evaluation took place). The proposed rule relied on the following conclusions from the Evidence Report:

> "Overall, the compiled information demonstrates that sites requiring cleanup under Superfund in the past, and sites operational in 2009 share characteristics related to the potential release of CERCLA hazardous substances and the exposure of human and ecological receptors, and illustrated the applicability of EPA's CERCLA experience to evaluating currently operating mines and processors."[55]

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[54] *See* Releases from Hardrock Mining Facilities, EPA-HQ-SFUND-2015-0781-0497; Comprehensive Report: An Overview of Practices at Hardrock Mining and Mineral Processing Facilities and Related Releases of CERCLA Hazardous Substances, EPA-HQ-SFUND-2015-0781-0144; and Evidence of CERCLA Hazardous Substances and Potential Exposures at Section 108(b) Mining and Mineral Processing Sites, EPA-HQ-SFUND-2015-0781-0505.
[55] 82 FR 3475.

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Upon review, EPA has now determined that those conclusions are not supported by the information provided in the Evidence Report. Further, these conclusions are not a primary factor in determining the "degree and duration of risk" presented by currently operating mines under modern environmental regulations. As a result, the Evidence Report does not support a rulemaking under section 108(b).

First, the Evidence Report compares releases of hazardous substances at 24 facilities on the NPL that continued to operate after 1980 (called post-1980 historical sites) to facilities operating in 2009. It does not specify whether or not 1980 can be considered a date by which mining facilities could be considered modern facilities subject to modern regulations. The report does not identify or consider whether the releases from the historical sites were due to pre-1980 activities and practices or whether the releases were caused by practices that are no longer typical of current mines. Instead, the report conflates risks posed by the historical facilities to risks posed by the 2009 facilities by comparing mining practices and contaminants of concern released at the facilities.

When comparing mining practices, the report does not take into account the fact that by 2009, practices at mining facilities were already heavily regulated. For example, the effluent limitation for processes that use cyanide to extract gold or silver is zero discharge.[56]

When comparing contaminants of concern, the Evidence Report identifies contaminants of concern at the historic sites through CERCLA response action documentation.[57] In contrast, at the 2009 operating sites, contaminants of concern are identified through reports of TRI releases and through discharge monitoring reports submitted pursuant to Clean Water Act

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[56] See 40 CFR 440.100(d).
[57] Evidence Report, at 9.

permits.[58] The report fails to acknowledge that the evidence presented regarding releases of hazardous substances from facilities operating in 2009 is not evidence of risk. "TRI data do not reveal whether or to what degree the public is exposed to listed chemicals."[59] Further, releases reported under Clean Water Act permits are regulated releases. The fact that the same hazardous substances may be present at historic modern hardrock mining facilities is simply a consequence of the type of ores and processes used at hardrock mines. The mere presence of hazardous substances is not equivalent to risk. Similarly, the existence of common environmental receptors at historic and modern mines is not determinative of risk. The presence of a receptor does not indicate that there are releases of hazardous substances at levels that cause risk. Rather, the primary determinant of risk is how current operations at the mine are conducted, including the current regulatory regime under which they operate. As documented in this final action, it is in this respect that most of the historic examples discussed in the proposed rule differ from the modern mines that would actually be subject to its requirements.

Finally, the Evidence Report admits that the releases identified as a cause of past fund expenditures are now regulated under the Clean Air Act and RCRA.[60]

As a result of these limitations, the Evidence Report fails to identify substantial risks associated with modern hardrock mining facilities and therefore does not support a rule that would impose financial responsibility requirements on the current hardrock mining sector.

Releases Report and Practices Report

Implicitly recognizing the limitations of the Evidence Report, as well as the inability to rely on reports that are decades old,[61] EPA developed two additional reports to attempt to

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[58] Evidence Report, at 17.
[59] See https://www.epa.gov/sites/production/files/2015-06/documents/factors_to_consider_6.15.15_final.pdf.
[60] Evidence Report, at 55-56.
[61] See the 1992 and 1997 reports cited at 82 FR 3475.

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provide record support for a rule under section 108(b), the Releases Report and the Practices Report.

The Releases Report was intended to "substantiate the ongoing existence of environmental risk from releases to the environment from hardrock mining and mineral processing operations in spite of improved regulation of and practices instituted by the hardrock mining and mineral processing industry."[62] It purports to document releases from facilities "that had no previous significant legacy mining issues."[63]

The report lists sites that required CERCLA, CERCLA-like, and potential CERCLA actions, and describes the release and response narratively. However, the limitations of this report prevent it from supporting a determination that requirements under section 108(b) for hardrock mining facilities are appropriate. As discussed in section E, below, and in the Technical Support Document for this final rule,[64] the Releases Report included facilities with significant mining activity that pre-dated modern regulation, creating legacy contamination. The report also fails to address whether or not the releases resulted in the expenditure of federal dollars or appropriately distinguish releases that predate modern regulation and are now prohibited by law or otherwise regulated.

The Practices Report purports to present information on the potential for future releases at operating hardrock mining facilities.[65] However, the Practices Report acknowledges that it cannot be used to draw conclusions about future releases, stating that: "Many sites and facilities within the non-operating and currently operating samples have been active for a century or longer. When a post-1980 release occurred at these facilities, it was difficult to determine if the

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[62] Releases Report, at 1.
[63] 82 FR 3471.
[64] See: EPA, CERCLA Section 108(b) Hardrock Mining Final Rule: Technical Support Document, December 1, 2017.
[65] Practices Report, at 1.

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equipment or practice responsible for the release was newly constructed or part of the site's past operations."[66] The Practices Report acknowledges that "a number of factors limited the inferences that can be drawn from data about releases at currently operating facilities."[67]

Both reports also lack important information on whether or not the releases resulted in the expenditure of federal dollars or whether the releases identified are now prohibited by law or otherwise regulated. As noted in section E, below, and the Technical Support Document for this final rule, many of the releases discussed in those reports are being addressed by the responsible parties.

Despite the limitations of the Releases Report and the Practices Report, the proposed rule claimed that they validated the conclusions of earlier reports stating that: "EPA believes the results of this relatively recent effort to further document the state of current mining practices substantiates the findings from the other documents described herein [the Evidence Report and the reports from 1992 and 1997] and further reinforces the Agency's belief that currently operating hardrock mining and mineral processing facilities subject to this proposal continue to present risks of release of hazardous substances."[68]

As discussed above, upon reexamination, EPA now believes that none of these reports provide an appropriate basis for identification of the risk of hazardous substance releases at the facilities that would be regulated under the proposed rule or the risk of federally financed response actions at such facilities. Additional relevant information on many of the sites discussed in these reports which helped inform EPA's conclusions in this final rule is documented in section IV.E below and in the Technical Support Document.

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[66] Id., at 5.
[67] Practices Report, at 9.
[68] 82 FR 3475.

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2. *Federal and State Regulatory Requirements.*

EPA has determined that modern regulation of hardrock mining facilities, among other factors, reduces the risk of federally financed response actions to a low level such that no additional financial responsibility requirements for this industry are appropriate. This section summarizes the regulations that support that determination.

a. Federal Environmental Statutes

The proposed rule proposed to regulate facilities that engage in the extraction, beneficiation, and processing of metals, (*e.g.*, copper, gold, iron, lead, magnesium, molybdenum, silver, uranium, and zinc) and non-metallic, non-fuel minerals (*e.g.*, asbestos, phosphate rock, and sulfur), other than placer mining, exploration only activities, and mines and processers disturbing less than five acres.[69] This scope includes mines, processors, and smelters.

While much mining and beneficiation is exempt from RCRA,[70] these activities are regulated under the Clean Water Act and the Clean Air Act. In addition, some waste material from covered mineral processing facilities is regulated under RCRA. Finally, permissions to mine on federal land are subject to review under the National Environmental Policy Act and may require the preparation of an Environmental Impact Statement.

Clean Water Act

The Clean Water Act (CWA) prohibits discharges to waters of the United States, unless in compliance with another portion of the Act.[71] Principal among those other provisions is the permitting program established under section 402 of the Act, the National Pollution Discharge

[69] See Proposed 40 CFR 320.60.
[70] See 51 FR 24496.
[71] 33 U.S.C. 1311.

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Elimination System (NPDES).[72] Existing dischargers of toxic and nonconventional pollutants are required to install best available control technology that is economically achievable.[73] New dischargers must meet new source performance standards, based on the best available demonstrated control technology. If these technology-based standards do not fully protect water quality, then a facility must adopt additional controls to meet applicable water quality standards (water quality-based effluent limitations).[74]

Technology-based effluent limitations for hardrock mining are found at 40 CFR Part 440. The Ore Mining and Dressing Effluent Guidelines apply to facilities in twelve subcategories as follows:

Iron Ore

Aluminum Ore
Uranium, Radium and Vanadium Ores
Mercury Ore
Titanium Ore
Tungsten Ore
Nickel Ore
Vanadium Ore (Mined Alone and Not as a Byproduct)
Antimony Ore
Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores
Platinum Ores
Gold Placer Mining

The Background Document for the proposed financial responsibility formula states: "Nearly three-quarters of the 354 currently operating facilities report mining five commodities (gold, iron, copper, phosphate, and uranium), with gold mines alone making up nearly half of the universe."[75] Accordingly, subpart J, the Copper, Lead, Zinc, Gold, Silver, and Molybdenum

[72] 33 USC 1342.
[73] 33 USC 1311.
[74] 33 USC 1311(b)(1)(C).
[75] EPA-HQ-2015-0781-0500 at 3-11.

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Ores Subcategory, is of particular relevance. Last amended in 1982 (effective January 1983), this subpart applies to:

(1) Mines that produce copper, lead, zinc, gold, silver, or molybdenum bearing ores, or any combination of these ores from open-pit or underground operations other than placer deposits;

(2) Mills that use the froth-flotation process alone or in conjunction with other processes, for the beneficiation of copper, lead, zinc, gold, silver, or molybdenum ores, or any combination of these ores;

(3) Mines and mills that use dump, heap, in-situ leach, or vat-leach processes to extract copper from ores or ore waste materials; and

(4) Mills that use the cyanidation process to extract gold or silver.[76]

Under this subpart, the following activities must meet an effluent limitation of zero discharge:

(1) Mine areas and mills processes and areas that use dump, heap, in situ leach or vat-leach processes to extract copper from ores or ore waste materials (40 CFR 440.103(c)); and

(2) Mills that use the cyanidation process to extract gold or silver (40 CFR440 103(d)). In addition, drainage from all mines in this subcategory and discharges from mills in this category that use a froth-flotation process must meet limitations for copper, zinc, lead, mercury, and cadmium.

Discharges to water from mineral mining and processing facilities are regulated under 40 CFR Part 436. Last amended in 1979, these regulations require best practicable control

[76] 40 CFR 440.100

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technology for wastewater discharges from mine drainage, mineral processing operations and stormwater runoff. This Part includes subpart R, which applies to the mining and the processing of phosphate bearing rock, ore or earth for the phosphate content. These regulations regulate the pH of discharges from phosphate mines and limit discharges of total suspended solids from such mines to a daily maximum concentration of 60 mg/l.

The Clean Water Act regulates discharges of pollutants from smelters under 40 CFR Part 421 (Nonferrous Metals Manufacturing Category). Last amended in 1984, these regulations limit pH and the concentration of metals in discharges.

Clean Air Act

The Clean Air Act regulates air emissions from industrial processes like mining and mineral processing. These include National Emissions Standards for Hazardous Air Pollutants (NESHAPs) as well as New Source Performance Standards (NSPS).

The 2011 NESHAP for gold ore processing and production facilities controls mercury air emissions from these facilities. 40 CFR Part 63 Subpart EEEEEEE.

On June 12, 2002, EPA promulgated final air toxics standards for the Primary Copper Smelting major sources 40 CFR Part 63 Subpart QQQ. These regulations control emissions of arsenic, beryllium, cadmium, chromium, lead, manganese and nickel. On June 4, 1999, EPA promulgated a NESHAP for primary lead smelting (40 CFR Part 63 Subpart TTT) that controls emissions of lead. In 2007, EPA promulgated a NESHAP for zinc, cadmium and beryllium smelters (40 CFR Part 63 Subpart GGGGGG), and those regulations established a particulate matter standard. Under section 111 of the CAA, New Source Performance Standards (NSPS) applicable to metallic mineral-processing plants have been established (40 CFR 60 Subpart LL

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control emissions of particulate matter). EPA's 1976 NSPS for primary lead smelting (40 CFR Part 60 Subpart R) controls emissions of particulate matter.

RCRA

While most hardrock mining and beneficiation waste is exempt from RCRA subtitle C,[77] mineral processing waste (other than twenty "special wastes") are not.[78] Thus, mineral processing facilities may be regulated under RCRA Subtitle C. The management of hazardous wastes is generally subject to strict minimum technology requirements.[79] Land disposal of hazardous wastes is prohibited unless treatment standards are met.[80]

National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires an environmental review of major federal actions significantly affecting the quality of the human environment.[81] Major federal actions include the issuance of federal permits or permission to use federal lands.[82] Mining activities on federal lands are generally subject to NEPA. Accordingly, the potential environmental impacts of those activities are considered and publicly disclosed before they occur. These reviews include consideration of impacts to surface water, ground water, air, soils, ecosystems, wetlands, endangered species, and flood plains.

b. Federal Land Management Laws

The Bureau of Land Management (BLM) and the Forest Service (herein referred to at the Federal Land Management Agencies (FLMAs), have both promulgated regulations that apply to hardrock mining operations on land they manage.

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[77] 51 FR 24496 (July 3, 1986).
[78] See the list at https://www.epa.gov/hw/special-wastes#mining.
[79] 42 U.S.C. 6924(o).
[80] 42 U.S.C. 6924(d)-(g).
[81] 42 U.S.C. 4332.
[82] 40 CFR 1508.18.

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BLM has promulgated regulations under the Federal Land Policy and Management Act (43 U.S.C. 1701 et seq.) that apply to hardrock mining operations on BLM land. These regulations include a requirement to develop a plan for reclamation of disturbed areas and a financial guarantee sufficient to fund completion of the reclamation plan.[83]

In order to obtain a permit to mine on public lands, the operator must submit a plan of operations that includes plans for water management, rock characterization and handling, spill contingency, and reclamation.[84] The plan of operations for the mine cannot be approved until thirty days after a final environmental impact statement has been prepared and filed with EPA.[85] The required reclamation plan must detail stabilization of land disturbed for mining, reclaiming and reshaping the land, wildlife rehabilitation, controlling potentially hazardous materials, and post-closure management.[86]

Like BLM, the Forest Service also requires a plan of operation that includes a plan for reclamation of mining disturbances on Forest Service lands.[87] The requirements for environmental protection are set forth in 36 CFR 228.8 and include compliance with all air quality, water quality, and solid waste standards; protection of scenic values; and reclamation to control erosion and water runoff, isolate, remove or control toxic materials, reshape and revegetate disturbed areas, and rehabilitate fisheries and wildlife habitat. The Forest Service requires a bond to cover the cost of stabilizing, rehabilitating, and reclaiming the area of operations.[88] Like a BLM plan of operations, approval of a Forest Service plan of operations also is subject to NEPA.

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[83] 43 CFR 3809.
[84] 43 CFR 3809.1-6.
[85] 43 CFR 3809.1-6.
[86] 43 CFR 3809.1-3(d).
[87] 36 CFR part 228.
[88] 36 CFR 228.13.

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The Forest Service regulations allow the Forest Service to require a modification to the Plan of Operations and reclamation plan (36 CFR § 228.4(e)) and adjust the bond to cover the modified plan (36 CFR 228.13(c)).

EPA's conclusion that BLM and Forest Service regulations address risks at hardrock mining facilities is further supported by the comments submitted by these agencies, discussed below.

c. Other Existing Regulatory Requirements.

The proposed rule stated that addressing CERCLA liabilities is different from the mine reclamation bonding requirements required by BLM, the Forest Service, or state requirements that seek to ensure compliance with technical engineering requirements imposed through a permit, or to ensure proper closure or reclamation of an operating mine.[89] This discussion in the proposed rule was intended to highlight legal distinctions between the section 108(b) requirements and the requirements of other federal and state programs. However, even when developing the proposed rule, EPA acknowledged the overlap between the risks to be addressed by section 108(b) and existing federal and state regulations. EPA now recognizes that the existence of these other programs, whatever legal differences there may be in their intent and implementation, are critical to understanding "the degree and duration of risk associated with the production, transportation, treatment, storage, or disposal of hazardous substances" as well as the risk to taxpayers of being required to fund response activities under CERCLA, which are the primary factors relevant to EPA's determination of the need for and appropriate level of financial responsibility requirements under section 108(b).

[89] 82 FR 3403.

For example, 16 of the 27 sites discussed in the Releases Report are called "CERCLA-like" releases. Thus, according to the Releases Report, these sites present the same type of risk that is to be addressed under section 108(b). However, as discussed below and in the Technical Support Document for this final rule, we have documented no expenditure of funds by EPA for those "CERCLA-like" releases, which, as is explained in the Releases Report, are being addressed under other state and Federal programs, demonstrating that modern regulation adequately addresses the risk of Fund financed response action posed by these sites.[90]

Even the methodology used in the proposed rule to develop the proposed financial responsibility requirements shows that the actual physical risks addressed by modern regulations are essentially the same as the risks to be addressed by section 108(b). The Background Document for the financial responsibility formula demonstrates that the costs of existing federal and state reclamation and closure requirements were used to develop costs for the categories of response activities that are the building blocks of financial responsibility requirements under the proposed rule.[91] Thus, the proposed financial responsibility requirements largely address the same risks that are addressed by existing regulatory requirements.

This conclusion is further supported by comments submitted by the Forest Service, and a number of states opposing the proposed rule. The Forest Service demonstrated in their comments how their regulations address the same physical risks that are captured in the response categories that are the building blocks of the proposed section 108(b) financial responsibility

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[90] The limited number of sites referenced in the Releases Report for which there were CERCLA actions and EPA expenditures are discussed below.

[91] See CERCLA 108(b) Financial Responsibility Formula For Hardrock Mining Facilities, Background Document, Sept. 19, 2016 (EPA-HQ-2015-0781-0500), at 2-17, Table 2.2. See also 82 FR 3462 ("EPA found that such engineering cost data was readily available from cost estimates developed for state and Federal mining reclamation and closure plans, and associated documents.").

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formula.[92] The states of Alaska, Nevada, New Mexico, and South Dakota each provided a similar analysis for their state, and the Interstate Mining Compact Commission provided analyses for Arizona, South Dakota, and Utah.[93] The National Mining Association (NMA) also compiled similar information for 15 states.[94]

In conclusion, EPA is convinced by the arguments made by state and Federal commenters that the risks sought to be addressed by the proposed rule are already addressed by existing state and Federal programs. The proposed rule would have considered the risk reduction of existing regulations only as a means to reduce the amount of otherwise required financial responsibility and sought comment on several aspects of this approach. EPA is now convinced that those regulations obviate the need for additional financial responsibility requirements under section 108(b) on the hardrock mining sector. As stated by the Forest Service:

> "[T]he fact that EPA refers to existing regulations as a rationalization for building the requirements of a particular reduction [in financial responsibility] serves to underline that these existing regulations serve the purpose that EPA hopes is served by the proposed rule: to reduce the risk of a release of a hazardous or toxic substance. Therefore, the specific requirements in the reductions are unnecessary, because other programs with more site-specific presence than EPA has, are already requiring these actions, using site-specific conditions as criteria for design of the mitigations in question. Thus, the outcome is that EPA is attempting to regulate that which is already regulated."[95]

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[92] See comment from the Forest Service, EPA -HQ-SFUND-2015-0781-2400, at page 2.
[93] Alaska (Attachment 5/Attachment D to EPA-HQ-SFUND-2015-0781-2785); Nevada (Appendix to EPA-HQ-SFUND-2015-0781-2651); New Mexico (Attachment A at p. 17 of EPA-HQ-SFUND-2015-0781-2676); South Dakota (Attachment to EPA-HQ-SFUND-2015-0781-2419); IMCC (showing results for Arizona, South Dakota, and Utah at EPA-HQ-SFUND-2015-0781-2758 & EPA-HQ-SFUND-2015-0781-2757).
[94] EPA-HQ-SFUND-2015-0781-2794 at Appendix A.
[95] See comment EPA-HQ-SFUND-2015-0781-2400, at page 11.

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3. *Risk of Payments from the Fund*

According to the preamble of the proposed rule, EPA estimated that the historical costs of responding to releases from 243 hardrock mining and minerals processing facilities totaled $12.9 billion, of which approximately $4 billion was paid for through EPA's Superfund program. EPA relied on this estimate to conclude that: "Such significant cleanup costs may be considered as an indication of the relative risks present at these sites, and the potential magnitude of environmental liabilities associated with this industry overall."[96]

As discussed above, EPA has now determined that as a result of modern regulations, the degree and duration of risk associated with the modern production, transportation, treatment, storage or disposal of hazardous substances by the hardrock mining industry does not present a level of risk of taxpayer funded response actions that warrant imposition of financial responsibility requirements for this sector.

EPA acknowledges that the Agency has incurred response costs at mining sites. However, as many commenters have noted, the vast majority of those costs have been to address legacy practices. EPA also acknowledges that there are a handful of examples of sites where EPA has incurred response costs, notwithstanding regulation under the Clean Water Act, or other state and federal law. However, the Agency does not believe that these few examples are an appropriate basis for regulation under CERCLA section 108(b).

The record for the proposed rule includes background information on response costs, expenditures, and settlements at 185 NPL sites and 134 non-NPL sites to inform the proposed financial responsibility formula.[97] To develop this information, EPA collected and reviewed data

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[96] 82 FR 3479.

[97] CERCLA 108(b) Financial Responsibility Formula For Hardrock Mining Facilities, Background Document, Sept. 19, 2016 (EPA-HQ-2015-0781-0500), at sections 2.1 and 2.2, and Appendix B. The formula also includes estimated

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available in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), the Integrated Financial Management System (IFMS), and the Office of Enforcement and Compliance Assurance (OECA) settlements database, as well as a 2004 report of the EPA Inspector General, and a 2010 report from the Government Accountability Office.[98] As part of this analysis, EPA combined data from CERCLIS and IFMS into a Microsoft Access file to summarize Fund expenditures incurred at each hardrock mining facility for which EPA had data (as of 2011).[99] A link to an FTP site containing these files was provided in the docket.[100]

While the purpose of this data collection was to support the development of the financial responsibility formula, it also can be used to examine Fund expenditures at specific sites. For example, the results of a query of the Microsoft Access file on site expenditures results in a table that has data for only eight of the 27 sites identified in the Releases Report.[101] The discussion of why the releases at these sites do not support the proposed rule is discussed in the Technical Support Document accompanying this final rule.[102] Of the eight, seven are gold or gold and

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costs for natural resources damages and public health assessments. However, both are a function of a release that requires a response action. In the formula, health assessment costs are simply a fixed cost of $550,000 and the natural resource damages are assumed based on a percentage of the response costs. Id. at section 5 and page 6-2.

[98] Id. at 2-1. EPA was able to obtain cost information for 319 hardrock mining facilities.

[99] Id. at 2-2. If EPA itself had incurred expenditures at a hardrock mining facility, those expenditures would have been included in the data pulled from these databases.

[100] It also is available here: ftp://newftp.epa.gov/CERCLA108B

[101] See the site expenditure table from the D Site Exp.accdb file on the FTP site. These sites are Barite Hill, a gold and silver mine in South Carolina ($6.3 million), Brewer Gold, a gold and silver mine in South Carolina ($12.3 million), Cimarron Mine, a gold mine in New Mexico ($3.5 million), Formosa Mine, a copper and zinc mine in Oregon ($3.1 million), Gilt Edge mine, a gold and silver mine in South Dakota ($75 million), Grouse Creek mine, a gold mine in Idaho ($314,000), Silver Mountain, a gold and silver mine in Washington ($1.4 million), and Summitville, a gold and silver mine in Colorado ($226 million). These numbers are presented in nominal dollars and are current as of 2011. The Microsoft Access file on settlements available at the same FTP site shows past cost settlements totaling $12.7 million at Gilt Edge, response work and past cost settlements totaling over $9 million at Grouse Creek, and past cost and future cost settlements at Summitville totaling approximately $49 million. See the settlements table from the cerclis_historical_sites_41612.accdb file on the FTP site.

[102] The Technical Support Document addresses all but two of the eight sites discussed in the Releases Report for which there is a record of Fund expenditures. Silver Mountain is a gold and silver mine that operated beginning in

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silver mines. Of the seven, six were operational after the effective date of Clean Water Act effluent limitations applicable to cyanide heap leach mining processes. Thus, regulation does not always prevent releases. In fact, the release at the Summitville Mine in Colorado was significant and the response was very costly. As discussed in the Technical Support Document accompanying this final rule, the costs of response at that site included costs of addressing acid mine drainage from legacy (since 1890) operations, unrelated to the releases from cyanide heap leach process. Further, Colorado has since changed its regulation to prevent a repeat of the releases that occurred from the heap leach process at Summitville. Thus, Summitville mine is not an example of current risk. However, it also is important to understand that, according to a 1996 retrospective review of Summitville prepared by an EPA Region 8 employee and the Colorado Department of Natural Resources, the Colorado-issued Clean Water Act permit, which assumed no discharge from the heap leach process, was based on an erroneous water balance calculation for the site. The permit assumed that evaporation would be greater than precipitation.[103] EPA's financial responsibility formula similarly relies on water balance data, and could be subject to the same type of error, demonstrating that neither regulation nor financial responsibility requirements are infallible.[104]

Issues with the financial responsibility formula in the proposed rule are also discussed in, January 19, 2017 comments submitted by the Small Business Administration (SBA) Office of

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1928 and that used a cyanide heap leach process before the promulgation of strict Clean Water Act regulations for those processes. See Releases Report, at 7. Grouse Creek was operated by Hecla Mining Company and the Microsoft Access files on the FTP site show only $314,000 in EPA expenditures and a greater amount in cost recoveries. Thus, these sites are not evidence of risk of Fund-financed response actions at currently operating sites.

[103] The Mining History and Environmental Clean-up at the Summitville Mine. Colorado Geological Society Open File Report 96-4. Available at http://2fdpn7hy0ht206jws2e9og41.wpengine.netdna-cdn.com/wp-content/uploads/2013/08/38.pdf

[104] EPA-HQ-2015-0781-0500, at section 3.4.

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Advocacy. SBA used data in the record to compare the results of the proposed financial responsibility formula against actual site costs at six mining sites. The formula both underestimated, and in some cases greatly overestimated the costs of response. For example, at one mine the actual costs to address an open pit were $77,000, while the formula would have required financial responsibility in the amount of $197,900,000 for this response activity.[105] At another site, the formula would have required evidence of financial responsibility to cover interim operation and maintenance at a level of $69 million while the actual costs reported by the site operator who is paying for the response action pursuant to its reclamation plan were over $96 million.[106] EPA acknowledges that any formula with limited site specific information is necessarily a very imprecise means of determining potential response costs, and may significantly over or underestimate actual costs, as documented in the SBA comments. As noted by several commenters, financial assurance amounts established by state and other Federal regulatory programs are usually informed by site-specific assessments by on-the-ground regulators and are thus likely to better reflect actual response costs.

The conclusion that modern regulation has greatly reduced the risk of taxpayer financed response actions also is supported by the experience of other federal agencies. For example, in letters sent to Senator Murkowski, BLM and the Forest Service stated that no modern mines permitted since 1990 by either BLM or the Forest Service have been added to the NPL. When asked how many mining plans of operation BLM and Forest Service have approved since 1990, and how many of the corresponding sites have been placed on the NPL, BLM responded that it had approved 659 plans since 1990 and none had been added to the NPL and the Forest Service

[105] EPA-HQ-SFUND-2015-0781-1406, at 18.
[106] Id. (discussing Hycroft Resources, an active gold mine in Nevada). See also discussions of Hycroft in the Background Document for the financial capability formula. EPA-HQ-SFUND-2015-0781-0500.

reported approval of 2,685 plans since 1990 with no sites being placed on the NPL.[107] These data support a conclusion that federal financial responsibility programs (and related mining engineering and permitting requirements) have been effective at lowering risk, reducing taxpayer liability, and contrasts strongly with the historical record involving legacy mines.

States have had similar experience with their own programs. The state of Nevada, which has roughly one fourth of hardrock mines in the potentially regulated universe of mines developed by EPA for purposes of analysis in the proposed rule, has not had a case involving taxpayer funded response action since 1991, when the state's new rules were put in place.[108]

EPA considered these examples of the limited payment experience of the Fund, as well as the record relating to payments covered by federal and state financial responsibility instruments required under other federal and state law, and payments made pursuant to settlements and voluntary response actions[109] to further support EPA's determination that the degree and duration of risk associated with the modern production, transportation, treatment, storage or disposal of hazardous substances by the hardrock mining industry does not present a level of risk of taxpayer funded response actions that warrant imposition of financial responsibility requirements for this sector.

C. Comments Supporting a Final Rule

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[107] Letter dated June 21, 2011 from BLM Director Robert Abbey to Senator Lisa Murkowski, dated June 21, 2011; Letter dated July 20, 2011 from USDA Secretary Thomas Vilsack to Senator Lisa Murkowski, dated July 20, 2011. The letters were written in response to several questions posed by Senator Murkowski relating to hardrock mining programs on BLM and Forest Service lands.

[108] Nevada comments, at Appendix 3 (EPA-HQ-SFUND-2015-0781-2651).

[109] EPA considers this information to be encompassed by the categories of information set forth in section 108(b)(2) ("payment experience of the Fund, commercial insurers, courts settlements and judgments, and voluntary claims satisfaction").

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EPA received many comments on the proposed rule that expressed support for promulgation of financial responsibility requirements under section 108(b). Sixty comments from individual private citizens encouraged EPA to issue final requirements, as did four mass mailing letter campaigns sponsored by the Idaho Conservation League, Water Legacy, Friends of the Boundary Waters Wilderness, and Earthworks. The main comment in support of the rule came from Earthworks, representing 35 different environmental groups. [110]

Earthworks, et al commented that CERCLA financial assurance regulations are necessary to ensure enough funds are available to complete cleanup actions without shifting the burden to the general public. They also stated in their comments that the proposed regulations did not duplicate existing state rules, which they argued do not cover pipeline spills, tailings spills, tailings impoundment failures and other releases of hazardous materials which commonly occur at hardrock mines, and can result in substantial liabilities.[111] In a separate comment on the proposed rule, the Idaho Conservation League stated that the state of Idaho's financial assurance requirements do not authorize bonding for groundwater contamination and water treatment in perpetuity and that a section 108(b) rule is necessary to close that gap.[112]

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[110] Earthworks submitted comments on the proposed rule representing: Inform, Western Organization Resource Councils, Minnesota Center for Environmental Advocacy, Upper Peninsula Environmental Coalition, Natural Resources Council of Maine, Montana Environmental Information Center, Greater Yellowstone Coalition, Conservation Law Foundation, Northeastern Minnesotans for Wilderness, Friends of The Boundary Waters Wilderness, Northern Alaska Environmental Center, Save Our Sky Blue Waters, Gila Resources Information Project, Brooks Range Council, The Lands Council, Campaign to Save the Boundary Waters, Friends of The Clearwater, Rock Creek, Alliance, Save Our Cabinets, Patagonia Area Resources Council, Friends of the Kalmiopsis, Clean Water Alliance, Water Legacy, Park County Environmental Council, Great Basin Resource Watch, Wisconsin Resources Protection Council, Rivers Without Borders, Spokane Riverkeepers, Western Watersheds Project, Okanagan Highlands Alliance, Boise Chapter Great Old Broads for Wilderness, Copper Country Alliance, Nunamta Aulukestai, and Idaho Conservation League.

[111] See comment from Earthworks, et al, EPA-HQ-SFUND-2015-0781-2739, at page 2.

[112] See comment from Idaho Conservation League, EPA-HQ-SFUND-2015-0781-2700, at page 1.

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In their comments on the proposed rule, Earthworks stated that: "Strong CERCLA 108(b) regulations are necessary to protect taxpayers from incurring the cost of mine clean-up, and to ensure that clean-up of hazardous materials at mine sites occur in a timely manner." To support their conclusion, they specifically mentioned a 2005 report by the Government Accountability Office (GAO) that concluded that EPA should "fully use its existing authorities to better ensure that those businesses that cause pollution also pay to have their contaminated sites cleaned up." [113] They also pointed to a 2004 report by EPA's Office of Inspector General (IG) that identified 29 specific sites where, according to the IG, cleanup work was delayed or scaled back in ways harmful to human health and the environment because of funding shortfalls.[114] In addition to this report, Earthworks identified in their comments other examples of cleanup efforts at mines that they stated remain uncompleted due to insufficient funds being available, or that took an inordinate amount of time to complete, exposing the public to dangerous substances. As discussed in the specific case studies and the accompanying Technical Support Document, a number of the examples cited by the IG and Earthworks are not representative of the risk posed by currently operating hardrock mining facilities.

EPA appreciates Earthworks' concern that insufficient funds leads to incomplete or slow cleanup and restoration of mine sites. Earthworks acknowledges that the universe of entities that EPA proposed to regulate under the proposed rule excluded mines that are no longer operating. They recommended that the universe be expanded to cover mine operations that are no longer active but still retain a responsible party. They state that, "Many past hardrock mining facilities are already and/or will be the site of CERCLA liabilities and necessary response actions. The

[113] Earthworks, *et. al*, EPA-HQ-SFUND-2015-0781-2739, page 5.
[114] Ibid. page 5, 6.

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CERCLA 108(b) regulations should apply to these operations."[115] EPA disagrees with this comment, and notes that the Agency has determined the goals of a section 108(b) rule as described in the proposal have already been satisfied.

Earthworks also commented that "CERCLA 108(b) regulations are essential because they address risks and liabilities that aren't addressed in most other State or federal land management financial assurance programs, including spills, accidental releases, and tailings failures."[116] To support this conclusion, they point to several instances in ongoing mining operations where there are impacts to natural resources and/or groundwater due to ongoing mining operations which other federal or state rules fail to regulate. Earthworks also submitted comment claiming the need for financial responsibility for long-term water treatment. EPA recognizes that some historical mining operations have resulted in the need for long-term water treatment.[117] However, modern regulation of both process discharges and runoff, as well as reclamation requirements to control sources of contamination, significantly address those risks. Additionally, as discussed above, while EPA acknowledges that the risk of a release is never totally eliminated by the requirements of other programs, this residual risk is to be evaluated in light of EPA's discretion under the statute on whether to set section 108(b) requirements, and in light of the other information in the record for this action discussed elsewhere in this final rule. Viewed in this manner, such residual risk does not change EPA's conclusion that it is not appropriate to issue final section 108(b) requirements for current hardrock mining operations.

Water Legacy and Friends of the Boundary Waters Wilderness submitted separate comments expressing concern that Minnesota's financial assurance laws, for instance, are not

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[115] Ibid., page 11.
[116] Ibid., page 12.
[117] Ibid., page 2.

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adequate to cover mine pit seepage, waste rock pile seepage, tailings dam seepage and/or catastrophic dam failures.[118] However, as is discussed in the site examples elsewhere in this final rule and accompanying Technical Support Document, commenters submitted information to demonstrate that most releases at currently operating facilities are being addressed by owners and operators, and that the costs of these incidents at modern operations are generally not falling to the taxpayer.

EPA received comments from three federally-recognized tribes and from three Alaska Native Claims Settlement Act (ANCSA) resource managers regarding section 108(b) financial responsibility. Tribal comments were generally in support of the proposed rule, and cited some concerns about the potential negative impacts of hardrock mining on commercial enterprises and on subsistence living, along with the need to more fully identify the benefits of the rule. A primary ANCSA concern was that the section 108(b) financial responsibility requirements would duplicate existing federal and state requirements, resulting in a negative impact on Alaska Natives and states, that receive royalties through the Regional and Village Corporations. These comments are discussed in section VIII.G.

D. Comments Opposing a Final Rule

1. Comments Regarding Appropriateness of Information Used

a. Use of Information Not Relevant to the Mines to be Regulated under the Rule

Many commenters on the proposed rule, including mining companies, trade associations, as well as state and federal agencies, commented that EPA's record incorrectly characterized the on-going environmental risk at operating hardrock mining facilities by relying on information related to mines that were constructed and operated before current regulatory requirements were

[118] See comment from Water Legacy, EPA-HQ-SFUND-2015-0781-2649, at page 3.

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in place, rather than on information specific to current hardrock mining activities, which are highly regulated. Commenters argued that since the rule would not apply to inactive, non-operating sites, EPA should not rely on information related to such sites as part of its rulemaking record to justify the need for financial responsibility requirements for current hardrock mining operations. Several commenters disagreed with EPA's assertion in the proposed rule that the $4 billion spent by EPA through the Superfund for cleanup costs at historical hardrock mining facilities is an indication of the relative risk present at the facilities covered by the proposed rule. Commenters argued that the 2009 Priority Notice and the proposed rule did not differentiate between costs associated with the highly-regulated mining practices of today and pre-regulation practices in developing that number.

EPA agrees with commenters that information about facilities that present a level of risk similar to those proposed to be regulated is the most appropriate focus for the Agency's record for this action. EPA also agrees with commenters that because mining practices have changed significantly over the past several decades, information related to risk presented by mines that operated before those changes occurred may not reflect the level of risk presented by currently operating facilities that include controls such as surface water containment structures, engineered storage facilities, water treatment, impermeable liners, and leak detection and recovery systems. Finally, EPA agrees with commenters that the cost of addressing releases from mines that operated without the controls in place today should not be assumed to be comparable to the cost of addressing releases from current operations, where controls such as monitoring assure early detection.

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Commenters objected to the use of 1980 in the Practices Report,[119] (CERCLA was enacted in December 1980) as the point when "historic" mining practices changed over to "modern" ones. They felt this ignored the evolution of mining practices that took place since 1980, in response to other environmental laws, as well as state mining regulations which were still in their infancy in 1980. Some commenters seemed to agree that EPA should consider "modern" mining practices to have begun post-1990, and some suggested that the mid-1990s was the true beginning of modern hardrock mining practices.

In evaluating the record for this rulemaking, EPA considered the issue of when mining operations became "modern" or "current." EPA recognizes that there are not nationally-applicable federal standards governing the operation of mines,[120] and that the current regulatory scheme of federal and state mining programs has evolved over time. Thus, the requirements of individual hardrock mining programs developed at different paces and sequences. One commenter provided a table demonstrating the evolution of hardrock mining programs over time, extending from 1972 to 2014, and including the adoption of regulations in Alaska, Arizona, Arkansas, Montana, New Mexico, Nevada, and Utah during that period of time.[121] EPA has therefore concluded that no particular date in the past reliably distinguishes between "historic" or "legacy" and "current" or "modern" mines nationwide, and that a better approach is to consider operations taking place under the current applicable regulatory scheme as "current" operations, and mine operations that took place before the enactment of the currently applicable and relevant requirements as "historic" or "legacy."

b. Use of Data that Did Not Directly Demonstrate Risk at Current Hardrock Mining Operations

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[119] EPA relied on this date numerous times in the Practices Report (e.g., pages 7,8,72,119126,127,133, 145).
[120] In 1986 EPA made a determination under section 3001(b)(3)(C) of RCRA that wastes from the extraction of ores did not pose a significant enough risk to warrant regulation under Subtitle C of RCRA. 51 FR 24496.
[121] See comment from Freeport-McMoRan, EPA-HQ-SFUND-2015-0781-2793, Attachment B.

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Some commenters who opposed the rule objected to EPA's analysis of the information presented in the 2009 Priority Notice relating to hardrock mining risk. Commenters objected that EPA relied on inappropriate information to demonstrate risk at current hardrock mining operations, by focusing on data that does not address potential exposure to CERCLA hazardous substances, or the possibility that a CERCLA response action may occur in the future, that is -- Toxics Release Inventory (TRI), and data from the Hazardous Waste Biennial Report (BR).[122] Commenters argued that EPA's approach to identifying hardrock mining did not evaluate actual or potential risk.

EPA agrees with commenters that information regarding releases from hardrock mining facilities does not, in and of itself, demonstrate risk. For example, as noted in EPA's "Factors to Consider When Using Toxics Release Inventory Data" (2015), "TRI data do not reveal whether or to what degree the public is exposed to listed chemicals."[123] In fact, TRI data generally encompass releases that are permitted under the Clean Air Act (CAA), the Clean Water Act (CWA), or the Safe Drinking Water Act, as well as the lawful disposal of hazardous substances. Accordingly, EPA agrees that TRI data cannot help predict the risk associated with potential mismanagement and therefore cannot be used to support any determination under CERCLA section 108(b) that imposing financial responsibility requirements on a sector is appropriate. Similarly, EPA agrees that BRS data and National Response System (previously referred to as the Emergency Response Notification System (ERNS) data do not provide information on the risk, if any, posed by the management of hazardous substances at hardrock mines.

Another commenter stated that EPA's methodology for assessing risk was simply to describe some of the major mining practices that contributed to past CERCLA releases and

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[122] See, for example, comment from Comstock Mining, Inc., EPA-HQ-SFUND-2015-0781-2735, at page 31.
[123] See https://www.epa.gov/sites/production/files/2015-06/documents/factors_to_consider_6.15.15_final.pdf.

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simplistically conclude that similar practices are used today. The commenter argued that this approach is not accurate because it fails to account for the major changes in mining practices and regulatory requirements that are applied to modern mines. EPA agrees that it is important to consider modern mining practices and current regulatory regimes and has adopted that approach in this final action.

2. Comments that EPA Failed to Consider Relevant Information

Commenters on the 2009 Priority Notice and the proposed rule objected that EPA failed to consider relevant information in the 2009 Priority Notice and the proposed rule, specifically on the role of federal and state regulatory programs and protective practices in reducing risks at current hardrock mining operations, and on information on reduced costs to the taxpayer from regulatory programs and cleanup by owners and operators. For example, the American Exploration and Mining Association (AEMA) commented that the Federal Land Management Agencies and the states have significantly evolved their financial assurance programs with specific emphasis on post-closure care and maintenance, thereby minimizing the long-term potential for releases of hazardous substances and un-bonded agency liability. AEMA further commented that existing financial responsibility programs are working at modern mines and there is no need for a costly EPA program.[124]

a. Comments Providing Information on the Role of Federal and State Programs and Protective Mining Practices in Reducing Risks at Current Hardrock Mining Operations

Many commenters who opposed the rule objected that EPA's analysis failed to consider the technical or engineering requirements specified by other regulatory programs or the requirements that financial assurance be established to ensure that required measures will be

[124] See comments from American Exploration and Mining Association at Docket ID Number EPA-HQ-SFUND-2015-0781-2657, page 2.

funded when needed. The commenters stated that both types of requirements significantly decrease the risks posed by modern mines, including both risks to the environment and risks that potential future liabilities will not be funded by mining companies.[125] EPA agrees that due to the increased regulation of hardrock mining practices over the past several decades, mining operations are conducted in a manner that does not present the same level of risk as practices of the past.

Commenters provided extensive information regarding the requirements of those programs including design standards, engineering controls, and environmental monitoring. Commenters argued that engineering controls and best practices reduce the degree and duration of risk associated with the modern production, transportation, treatment, storage, and disposal of hazardous substances to minimal levels and that no additional financial responsibility requirements are necessary to protect the taxpayer or the Superfund. Some of these federal and state programs are discussed below.

(1) Examples of federal programs

The regulations of the Bureau of Land Management (BLM) and the Forest Service, applicable to hardrock mining facilities, are described below.

Bureau of Land Management

BLM's surface management regulations at 43 C.F.R. subpart 3809 govern the majority of the hardrock mining operations on the public lands that would be subject to the proposed rule. These regulations were first promulgated in 1980 pursuant to the agency's authority under the

[125] Freeport-McMoRan Inc; Fertilizer Institute; MiningMinnesota; New Mexico Environment Department and New Mexico Energy, Minerals, and Natural Resources Department; Colorado Department of Natural Resources, Division of Reclamation, Mining and Safety; National Mining Association.

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Mining Law of 1872,[126] and its mandate under section 302(b) of the Federal Land Policy and Management Act of 1976 to take any action to prevent "unnecessary or undue degradation" of the public lands.[127] BLM also regulates the development of solid minerals subject to other mineral disposal authorities, such as phosphate, through the issuance of permits and leases under 43 C.F.R. Part 3500. BLM's regulatory programs provide cradle-to-grave oversight of mining operations on the public lands. For example, BLM's subpart 3809 regulations require operators to obtain authorization from BLM to conduct any surface disturbance greater than casual use.[128] All operations under subpart 3809 must comply with the general and specific performance standards set forth in the regulations which govern, among other things, disposal of mining wastes and handling of acid-forming, toxic, or other deleterious materials.[129] In addition, subpart 3809 requires all operations to comply with applicable federal and state laws and regulations, including laws related to air and water quality.[130] For extractive mining operations and some exploration, operators under subpart 3809 must submit and obtain BLM approval of a plan of operations that includes plans for baseline data collection, water management, rock characterization and handling, spill contingency, and reclamation.[131] BLM's subpart 3809 regulations impose also requirements for design, operation, closure, and reclamation to ensure productive use of the land after mining. The required reclamation plan must detail stabilization of land disturbed for mining, reclaiming and reshaping the land, wildlife rehabilitation, controlling potentially hazardous materials, and post-closure management.

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[126] 30 U.S.C. §§ 22-54, as amended.
[127] 43 U.S.C. § 1732(b).
[128] 43 C.F.R. §§ 3809. 10, 3809.11.
[129] See 43 C.F.R. § 3809.420.
[130] See 43 C.F.R. §§ 3809.5, 3890.420(b)(4), (b)(5).
[131] 43 C.F.R. § 3809.401.

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BLM's regulations also require operators to provide a financial guarantee before they can begin all hardrock mining operations.[132] Moreover, financial guarantees for mining operations must remain in effect until BLM determines that reclamation has been completed in accordance with the authorized operations and the agency releases the financial guarantee.[133] BLM's regulations also allow the agency to initiate forfeiture of the financial guarantee in the event the operator refuses or is unable to conduct reclamation.[134]

Forest Service

The U.S. Department of Agriculture (USDA) Forest Service regulations governing mining under the Mining Law of 1872 were promulgated in 1974[135] and can be found at 36 CFR part 228 subpart A. Disposal of minerals such as phosphates, sodium, potassium, and hardrock minerals on acquired National Forest System lands are subject to the mineral leasing laws and are regulated by BLM under 43 C.F.R. part 3500.

Under the Forest Service regulations at 36 C.F.R. part 228, subpart A, operators must submit and obtain approval of a plan of operations before conducting any operations that might cause significant disturbance of surface resources.[136] The regulations are designed to minimize adverse environmental impacts both during and after mining operations. The regulations prohibit releases of hazardous substances, and require financial guarantee that is calculated to reasonably insure that operations and reclamation are conducted to avoid releases, and to respond to releases that may occur.[137] USDA highlighted in its comments how well developed Plans of

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[132] *See* 43 C.F.R. §§ 3504.50, 3809.4500
[133] 43 C.F.R. §§ 3504.71, 3809.590.
[134] 43 C.F.R. §§ 3504.65, 3809.595.
[135] See comment from United States Forest Service, Docket ID: EPA-HQ-SFUND-2015-0781-2400 at page 10; comment from National Mining Association, EPA-HQ-SFUND-2015-0781-2794 at page 29.
[136] 36 C.F.R. § 228.4(a).
[137] See comment from United States Forest Service, Docket ID: EPA-HQ-SFUND-2015-0781-2400 at page 2.

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Operations, site inspections, and monitoring reduce environmental risks before, during, and after mine closure. Specifically, USDA stated that an operator complies with Forest Service regulations by developing a Plan of Operations, which requires that the operator submit enough detail that the agency can analyze various risks associated with the proposed operation and, through the NEPA process, identify proper mitigation measures to reduce or eliminate those risks.[138] The regulations also require that, "all operations be conducted so as, where feasible, to minimize adverse environmental impacts on National Forest surface resources" (228.8). This allows the Agency to be very site-specific in its analysis of risk and mitigation.[139] A Plan of Operations must also include detailed reclamation and closure plans, which are reviewed and approved to minimize the potential future risk to the environment based on predicted outcomes.[140] USDA further stated that Plans of Operation must include hazardous materials inventory and handling procedures, spill prevention plans, and transportation mitigation measures.[141] USDA stated a Plan of Operations for a hardrock mining operation cannot be approved unless hazardous substances are managed so that the threat of present or future release is minimized.[142] During the mine permitting process, the Forest Service actively engages in memorandums of understanding and agreements with other State and Federal Agencies to ensure that all parties' permits are approved and implemented. Currently this can involve over forty separate permits and authorizations.

The Forest Service requires that mine operators provide a financial guarantee to assure complete reclamation and compliance with environmental laws under the following authorities:

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[138] Ibid.
[139] Ibid.
[140] Ibid., page 5.
[141] Ibid., page 4.
[142] Ibid., page 4.

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16 U.S.C. 551; 30 U.S.C. 612; 36 CFR 228.8, 228.13.[143] USDA stated that regulatory requirements (36 CFR 228.13) require operators to provide a bond sufficient to insure stabilization, rehabilitation, and reclamation of the area of operations.[144] Environmental protection measures described in under 36 CFR 228.8 also include certification of compliance with all other applicable environmental standards.[145] Forest Service regulations at 36 CFR 228.4(e) allow the agency to require a modification to the Plan of Operations to allow for bond adjustments to address unforeseen environmental effects.[146] In its comments on the proposed rule the USDA stressed that financial guarantee requirements further reduce financial risk to the public. The operator must provide a financial guarantee that must be of a sufficient amount to ensure that, upon closure, the operation no longer presents long-term risks to the environment and a liability to the Forest Service and the public. [147] USDA further noted that any ongoing obligation to continue the protection of the environment is also provided for in a long-term financial assurance instrument required by the Forest Service.[148]

Commenters also noted the role the NEPA plays in identifying risks at mining operations. NMA stated that a federal plan of operation is also scrutinized under NEPA, usually requiring the preparation of an environmental impact statement, which evaluates potential environmental impacts of the mining operation, assesses alternatives, and requires the identification of mitigation measures to reduce potentially significant environmental impacts.[149] The Forest

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[143] Ibid., page 1.

[144] Ibid., page 3.
[145] Ibid., page 3.
[146] Ibid., page 5.
[147] Ibid., page 5.
[148] Ibid., page 5.
[149] See comment from National Mining Association, EPA-HQ-SFUND-2015-0781-2794 at page 30.

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Service also offered several examples of the ways in which the NEPA process mitigates risk for mines which require the preparation of an environmental impact statement. Specifically, the Forest Service noted that it identifies closure requirements as part of the NEPA process after in-depth studies using site-specific data.[150] Moreover, Forest Service noted that proposed reclamation requirements and potential for releases at mines on NFS lands are examined and disclosed in NEPA documents prepared for Forest Service approval of the plan of operations, which are reviewed by EPA.[151] The Forest Service also noted that EPA reviews all NEPA documents, and comments on the adequacy of mitigation measures and reclamation plans in general. Once an operator incorporates source controls and mitigation measures into their plan, the Forest Service approves that plan, based on the expected outcomes and not the individual engineering standards used.[152] EPA notes that the NEPA process applies to all federal agencies and thus is not limited to only mines on NFS lands.

(2) Examples of state programs

A discussion of the mining programs of five states -- Nevada, New Mexico, Alaska, Colorado, and Montana -- is provided below. Of the 184[153] mining sites in the potentially regulated universe of mines developed by EPA for purposes of analysis in the proposed rule, roughly one fourth are located in Nevada, and roughly one tenth are located in New Mexico, Alaska, Colorado, and Montana combined. In addition to the examples discussed below, the record includes detailed information on the protectiveness of mining programs in Arizona, Utah,

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[150] See comment from United States Forest Service, Docket ID: EPA-HQ-SFUND-2015-0781-2400 at page 3.
[151] Ibid., page 5.
[152] Ibid., page 7
[153] This number does not include the stand-alone mineral processors in the potentially regulated universe of 221 hardrock mining facilities developed by EPA for purposes of analysis in the proposed rule.

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South Dakota, and Idaho that were provided by those states and state organizations.[154] Additional information on state programs also was provided by other commenters.[155]

Nevada

The Bureau of Mining, Regulation, and Reclamation of Nevada requires closure and reclamation for hardrock mines under the Nevada Revised Statutes (NRS) 519A.010 - NRS 519A.280 and the Nevada Administrative Code (NAC) 519A.010 - NAC 519A.415.[156] Nevada's regulatory program was enacted in 1989-1990 and includes the authority for the Nevada Division of Environmental Protection (NDEP) to require financial assurance for long-term management of mine-impacted waters.[157] Commenters reported that Nevada's stringent regulations "impose extensive permitting, design, operation, monitoring, corrective action, closure, reclamation, and financial assurance requirements on hardrock mining operations in the State.[158] In addition, because many mines in Nevada operate on federal lands, Nevada and BLM and Forest Service have entered into Memoranda of Understanding to ensure coordination of financial assurance requirements across private and public lands.[159] Mines in Nevada estimate the amounts of their required financial assurance through use of Nevada's Standardized Reclamation Cost Estimator

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[154] See comment and attachments from Beth A. Botsis, Deputy Executive Director, Interstate Mining Compact Commission, comment number EPA-HQ-SFUND-2015-0781-2759; EPA-HQ-SFUND-2015-0781-2758; EPA-HQ-SFUND-2015-0781-2757), discussing the protectiveness of mining programs in Arizona, Utah, and South Dakota. Together, Arizona and Utah have 35 potentially regulated mines. See also, comment from Governor Butch Otter, noting that that most of the mines in Idaho are on federally managed land and thus would be subject to Forest Service or BLM regulations, comment number EPA-HQ-SFUND-2015-0781-2682. Idaho has nine potentially regulated mines.

[155] See the discussion of comments on state mining programs in below.

[156] See comment from Nevada Lithium Corp, Comment Number: EPA-HQ-SFUND-2015-0781-2681 at page 4.

[157] See comment from Nevada Division of Environmental Protection, comment number EPA-HQ-SFUND-2015-0781-2651 at page 1.

[158] See comment from Newmont Mining Corporation, comment number EPA-HQ-SFUND-2015-0781-2712 at page 46-47.

[159] See comment from Nevada Division of Environmental Protection, comment number EPA-HQ-SFUND-2015-0781-2651, at page 2, and Attachment.

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(SRCE).[160] The SRCE is well-regarded amongst mining reclamation programs and is used by several other states and Federal agencies.[161]

Nevada's hardrock mining regulatory programs, including its reclamation surety program administered by NDEP, include stringent design standards, including standards in liner systems, dam safety, and tailings impoundments that are intended to manage and contain process wastes.[162] The regulations also specify treatment of spent ore heaps at closure to ensure surface and groundwater impacts are prevented.[163] NDEP provided comment that no modern mines that commenced operation after the promulgation of the Nevada mine reclamation financial assurance regulations have required public funding for proper closure or reclamation as evidence of the strength of Nevada's program.[164]

New Mexico

The New Mexico Mining Act ("Mining Act") was adopted in 1993 with the purposes of "promoting responsible utilization and reclamation of lands affected by exploration, mining or the extraction of minerals."[165] The Mining Act broadly defines "mining" and "minerals" to cover the extraction and processing of hardrock minerals.[166]

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[160] See comment from Nevada Lithium Corp, Comment Number: EPA-HQ-SFUND-2015-0781-2681, Page 4

[161] See comments from Women's Mining Coalition, Comment number EPA-HQ-SFUND-2015-0781-2705 at page 5, Pershing Gold Corporation, Comment number EPA-HQ-SFUND-2015-0781-2688 at page 6, Hecla Mining Company, Comment number EPA-HQ-SFUND-2015-0781-2688 at page 21, Mining and Metallurgical Society of America, comment number EPA-HQ-SFUND-2015-0781-2734 at page 3.

[162] See comment from Newmont Mining Corporation, comment number EPA-HQ-SFUND-2015-0781-2712 at page 48

[163] Ibid., page 49

[164] See comment from Nevada Division of Environmental Protection, comment number EPA-HQ-SFUND-2015-0781-2651 at page 2.

[165] See comments from New Mexico Environment Department and the New Mexico Energy, Minerals, and Natural Resources Department, Docket ID Number EPA-HQ-SFUND-2015-0781-2676-2 at page 4.

[166] Ibid. page 4

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Mining operations in New Mexico, both "existing" and "new,"[167] are required to obtain permits which include closeout, or reclamation, plans.[168] These plans, which are developed in coordination with closure plans required under the Water Quality Act, address the areas disturbed by mining including impacts from any of the thirteen site features identified by EPA as the sources of releases or threatened releases at hardrock mining sites.[169] The reclamation and remediation of these site features, which include tailings, waste rock, leach piles and open pits, are addressed in the permits issued under the Mining Act and the Water Quality Act.

Mining operations in New Mexico are subject to significant compliance and enforcement provisions. The Mining Act mandates a specific set of minimum inspections for each class of facility including one inspection a month when a mine is conducting significant reclamation activities. 170 If the agency determines that a facility is in violation of the Act, regulations or the permit or is creating an imminent danger to public health or safety or is causing significant environmental harm, the agency can order a cessation of mining or undertake administrative or judicial enforcement proceedings. [171] Violations can result in civil penalties of up to $10,000 a day, and knowing or willful violations can bring criminal penalties. [172]

Financial assurance is an integral and inseparable part of New Mexico's regulation of hardrock mining and attendant reclamation requirements. Before a permit can be issued under the Mining Act, financial assurance must be filed with the agency. "The amount of the financial

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[167] "existing mining operations" were producing minerals prior to June 18, 1993, and "new mining operations" began producing minerals after that date. §69-36-3(E) and (I).
[168] See comments from New Mexico Environment Department and the New Mexico Energy, Minerals, and Natural Resources Department, Docket ID Number EPA-HQ-SFUND-2015-0781-2676-2 at page 5.
[169] 82 FR 3461, fn. 171
[170] See comments from New Mexico Environment Department and the New Mexico Energy, Minerals, and Natural Resources Department, Docket ID Number EPA-HQ-SFUND-2015-0781-2676-2 at page 5.
[171] Ibid., page 5.
[172] Ibid., page 5.

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assurance shall be sufficient to assure the completion of the performance requirements of the permit, including closure and reclamation, if the work has to be performed by the director or a third-party contractor."[173] The financial assurance amount is based on a detailed engineering cost estimate to complete the approved reclamation plan and must be based on what it would cost the State, or the State's contractor, to complete the reclamation plan. Financial assurance must include costs for: contract administration; mobilization; demobilization; engineering redesign; profit and overhead; procurement costs; reclamation or closeout plan management; and contingencies.[174]

The New Mexico Environment Department (NMED) regulates mining operations under the New Mexico Water Quality Act ("Water Quality Act").[175] Enacted in 1967, the Water Quality Act requires the New Mexico Water Quality Control Commission ("WQCC" or "Commission") to adopt regulations to protect surface water and groundwater quality. The Commission must "adopt water quality standards for surface and ground waters of the state,"[176] and must also adopt regulations requiring a permit for "the discharge of any water contaminant."[177] The Commission authorizes NMED to place conditions on discharge permits to protect groundwater, and must deny a discharge permit if the discharge would cause or contribute to contaminant levels in excess of water quality standards at any place of present or potential future use.[178] The WQCC must adopt procedures for providing notice to interested persons and the opportunity for a public hearing, and must also adopt regulations "for the

[173] Ibid., page 5.
[174] Ibid., page 5.
[175] Ibid., page 6.
[176] Ibid., page 6.
[177] Ibid., page 6.
[178] Ibid., page 6.

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operation and maintenance of the permitted facility, including requirements, as may be necessary or desirable, that relate to the continuity of operation, personnel training and financial responsibility. "[179] Finally, the Water Quality Act was amended in 2009 to direct the WQCC to adopt regulations for the copper industry, resulting in a comprehensive and prescriptive set of copper mine regulations,[180] and in accordance with the directives of the Water Quality Act, the Commission has adopted a body of implementing regulations codified in Title 20, Chapter 6 of the New Mexico Administrative Code.

The stated purpose of the Ground and Surface Water Protection Regulations is "to protect all ground water of the state of New Mexico which has an existing concentration of 10,000 [milligrams per liter] or less [total dissolved solids], for present and potential future use as domestic and agricultural water supply."[181] The regulations include three categories of groundwater quality standards: (1) maximum numerical standards for thirty-three contaminants for protection of human health; (2) maximum numerical standards for nine contaminants and a range for pH for protection of domestic water supplies; and (3) maximum numerical standards for five contaminants for protection of water for irrigation use.[182]

The regulations also address discharge permits,[183] prohibiting any person from causing or allowing a water contaminant to "discharge so that it may move directly or indirectly into groundwater" unless that person is discharging pursuant to a discharge permit issued by NMED.[184] The regulations provide for notice to the public of a proposed discharge permit, and

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[179] Ibid., page 6-7.
[180] Ibid., page 6.
[181] Ibid., page 6-7.
[182] Ibid., page 6-7.
[183] Ibid., page 6-7.
[184] Ibid., page 6-7.

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the opportunity to request a public hearing on the permit. [185] The regulations further provide that a discharge permit may include a closure plan to protect ground water after the cessation of the operations causing the discharge. The closure plan must include "a description of closure measures, maintenance and monitoring plans, post-closure maintenance and monitoring plans, financial assurance, and other measures necessary to prevent and/or abate ... contamination."[186]

The Copper Mine Rule[187] was promulgated in 2013 and the state indicated that it is the most prescriptive rule governing copper mining operations in the United States. The Copper Mine Rule establishes specific operational, monitoring, contingency, closure, and post-closure requirements for copper mines to ensure protection of water quality and prevent the release of contaminants into the environment during operations and following closure. The Copper Mine Rule is supplemental to the general discharge permit regulations, and is implemented through the issuance of ground water discharge permits.

The Copper Mine Rule covers all aspects of mine operation and closure. The permit application requirements for copper mine facilities result in a comprehensive document that identifies all mine units at the facility including: impoundments; pipelines; tanks; leach stockpiles; waste rock stockpiles; crushing, milling, concentrating, smelting and tailing impoundments; open pits; underground mines; and, truck and equipment washing units.[188] Each of these respective mine units is subject to prescriptive engineering design criteria to control and prevent the release of contaminants.[189]

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[185] Ibid., page 6-7.
[186] Ibid., page 6-7.
[187] Ibid., page 7.
[188] Ibid., page 8.
[189] Ibid., page 8.

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Existing mine units in operation prior to promulgation of the Copper Mine Rule have extensive groundwater monitoring to determine their effectiveness in preventing the release of contaminants to the environment.[190] Discharge permit requirements for existing mine units include operation of groundwater interceptor systems, as well as seepage and surface runoff capture systems to ensure impacts are contained as close as is practicable.[191] The Copper Mine Rule requires development and implementation of a site-wide water management plan describing in detail how impacted storm water and groundwater at the site is contained and managed.[192] Construction and operation of new mine units or expansion of existing mine units is subject to detailed engineering design requirements that include lined leach stockpiles, double lined process water impoundments, leak detection systems, flow metering, and extensive groundwater monitoring.[193]

Proposals for new mine units such as waste rock stockpiles and tailing impoundments are required to include an aquifer evaluation to determine the nature and extent of any impacts to groundwater that may occur if these mine units are proposed to be unlined.[194] Based on the aquifer evaluation, the Copper Mine Rule requires a design report for proposed interceptor systems to ensure containment of groundwater impacted by the stockpile or tailing impoundment such that applicable standards will not be exceeded at monitoring well locations.[195] As previously stated, monitoring wells must be located as close as practicable to the various mine units being monitored.[196] Impacted water collected at a mine site typically is used in the process

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[190] Ibid., page 8.
[191] Ibid., page 8.
[192] Ibid., page 8.
[193] Ibid., page 8.
[194] Ibid., page 8.
[195] Ibid., page 8.
[196] Ibid., page 8.

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water system, offsetting use of potable water. Any impacted water in excess of process water requirements must be treated prior to release. [197] In the event a demonstration of containment cannot be satisfactorily made, a liner system placed beneath waste rock or tailing impoundments may be required.[198]

The Copper Mine Rule also contains prescriptive requirements for closure of mine units that have the potential to impact water quality[199] including requirements for process solution reduction plans[200] and closure water management and water treatment plans. [201] There are prescriptive engineering design requirements for surface re-grading and cover design to ensure storm water is routed off and away from encapsulated mine waste, and that infiltration into mine waste is minimized.[202] It should be noted that the prescriptive closure design criteria are based on designs that have been implemented successfully not only at copper mines in New Mexico, but mimic successful closure design that has been consistently required and applied at other mine sites in New Mexico.

Under these regulations, any hardrock mine that has the potential to impact groundwater must obtain a permit from NMED. The Water Quality Act provides numerous enforcement mechanisms for violations of the provisions of the Act, the regulations, a water quality standard adopted pursuant to the Act, or a condition of a permit issued pursuant to the Act. [203] These include injunctive relief ordered by a district court; suspension or termination of a permit

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[197] Ibid., page 8.
[198] Ibid., page 8.
[199] Ibid., page 9.
[200] Ibid., page 9.
[201] Ibid., page 9.
[202] Ibid., page 9.
[203] Ibid., page 6-7.

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allegedly violated;[204] civil penalties of up to $15,000 per day of noncompliance for a violation of the Water Quality Act permit provisions at NMSA 1978, Section 74-6-5, including regulations adopted or a permit issued pursuant to that section;[205] up to $10,000 per day for each violation of the Water Quality Act or regulations other than Section 74-6-5; up to $25,000 per day for each day of continued noncompliance with a compliance order; and criminal penalties.[206]

The New Mexico state commenters indicated that NMED and the New Mexico Energy, Minerals, and Natural Resources Department work closely together pursuant to a Joint Powers Agreement in drafting and issuing permits for hardrock mining facilities to ensure that financial assurance and other permit requirements are consistent, integrated, and complementary. These agencies allow permitted facilities to submit a single financial assurance instrument, or set of instruments, that are jointly held by the agencies, meeting the financial assurance requirements of both statutes. They also have Memoranda of Understanding with BLM and the Forest Service to avoid duplication where federal land is involved. Through mining permits issued under the Mining Act, and groundwater discharge permits issued under the Water Quality Act, the Agencies have jointly required permittees to establish financial assurance for all operating hardrock mines in New Mexico, as well as many that are no longer operating.

Freeport McMoRan Inc. commented that there are existing, state-imposed financial assurance requirements, often amounting to hundreds of millions of dollars per mine, that might be sufficient to protect against risks,[207] and offered the example that EPA itself has adopted state reclamation requirements specified in New Mexico law, as the CERCLA remedy for the Questa mine site.

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[204] Ibid., page 6-7.
[205] Ibid., page 6-7.
[206] Ibid., page 6-7.
[207] See comments from Freeport McMoRan, Inc., EPA-HQ-SFUND-2015-0781-2402 at page 9.

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Alaska

The Alaska Department of Environmental Conservation requires financial assurance to prevent releases from mines to water.[208] Financial assurance for reclamation at mines on state, private, municipal, and federal land is managed by the Alaska Department of Natural Resources under authority granted by the Alaska Mine Reclamation Act.[209] The act describes a general reclamation standard which "prevents unnecessary or undue degradation of land and water resources"[210] Under the mine permitting process undertaken for most large mines in Alaska, coordination with federal, state, and local governments is employed to review mine plans.[211] As evidence of the stringency of Alaska's requirements, AEMA offered comment that large mines in Alaska are required to undergo a comprehensive third-party environmental audit every five years.[212]

Alaska requires further safeguards for mines where the plan includes a dam. These requirements include operation and maintenance plans and contingencies in an emergency action plan.[213] Alaska made the "Guidelines for Cooperation with the Alaska Dam Safety Program" guidance available which outlines regulatory requirements applying to dams, including design standards, methods of analysis, [...] performance requirements and risk profile of the facility, operation, maintenance and monitoring requirements, emergency action planning and incident reporting, periodic safety inspections" as well as financial assurance.[214]

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[208] See comment from NOVAGOLD, comment number EPA-HQ-SFUND-2015-0781-2720 at page 2.
[209] See comment from Alaska Department of Environmental Conservation, comment number EPA-HQ-SFUND-2015-0781-2785 at page 9.
[210] See comment from Alaska Department of Environmental Conservation, comment number EPA-HQ-SFUND-2015-0781-2785 at page 9.
[211] Ibid., page 10-11.
[212] See comment from AEMA, comment number EPA-HQ-SFUND-2015-0781-2657 at page 10.
[213] See comment from Alaska Department of Environmental Conservation, comment number EPA-HQ-SFUND-2015-0781-2785 at page 10.
[214] Ibid., page 19.

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Colorado

In 1976, the Colorado state legislature passed the Mined Land Reclamation Act[215] (MLRA) establishing a Mined Land Reclamation Board ("Board").[216] The MLRA provided far more structure for permitting mine sites and, importantly, oversight of reclaiming these sites. The MLRA's legislative declaration stated:

> "It is the declared policy of this state that the extraction of minerals and the reclamation of land affected by such extraction are both necessary and proper activities. It is further declared to be policy of this state that both such activities should be and are compatible. It is the intent of the general assembly by enactment of this article to foster and encourage the development of an economically sound and stable mining and minerals industry and to encourage the orderly development of the state's natural resources while requiring those persons involved in mining operations to reclaim land affected by such operations so that the affected land may be put to a use beneficial to the people of this state. It is the further intent of the general assembly by the enactment of this article to conserve natural resources, to aid in the protection of wildlife and aquatic resources, to establish agricultural, recreational, residential, and industrial sites, and to protect and promote the health, safety, and general welfare of the people of this state."[217]

In 1984, the Colorado Division of Reclamation, Mining, and Safety (DRMS) permitted the Summitville mine.[218] This was a high elevation mine located in the historic mining district of Summitville in Southwest Colorado. Errors were made in the permitting review and initial build out of this mine site. The financial assurance at Summitville was not site-specific but based on a formulaic approach, and ultimately proved to be far short of the actual reclamation cost.[219] The large cyanide heap leach operation almost immediately encountered problems with construction

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[215] C.R.S. § 34-32-101 et. seq.
[216] See comments from Colorado Division of Reclamation, Mining and Safety at Docket ID number EPA-HQ-SFUND-2015-0781-2774, page 3.
[217] Ibid., page 4.
[218] Ibid.
[219] Ibid.

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and water treatment.[220] Ultimately, the operator walked away from the site after a significant environmental release leaving the state with an insufficient financial assurance.

The state indicated that it learned from the errors at Summitville, and the state legislature subsequently passed major programmatic revisions to the MLRA in 1993, strengthening permitting and enforcement provisions.[221] Most importantly, the MLRA was specifically amended to create a new class of mining sites now known as Designated Mining Operations (DMOs) and to clearly require financial assurance for all sites based on site specific, not formulaic, criteria.[222]

The DMO amendment is the backbone of Colorado's hardrock regulatory program and requires operators to submit an Environmental Protection Plan with numerous technical elements that were previously not required in light of lessons learned from Summitville .[223] A DMO's Environmental Protection Plan now describes how the operator assures protection of all areas that have the potential to be affected by designated chemicals, toxic or acid forming materials, or acid mine drainage.[224] The plan must include an Emergency Response Plan and must implement any measures required by Colorado Parks and Wildlife for the protection of wildlife or Colorado Water Quality Control Division for the protection of water quality.[225] Other aspects of the DMO amendment required submission of information to evaluate the potential for adverse impacts associated with acid mine drainage or acid or toxic producing materials to leach facilities, heap leach pads, tailing storage or disposal areas, impoundments, waste rock piles, stockpiles

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[220] Ibid.
[221] Ibid.
[222] Ibid.
[223] Ibid., page 5
[224] Ibid.
[225] Ibid.

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(temporary or permanent), land application sites and in-situ or conventional uranium mining operations.[226]

Further Environmental Protection Plans must include designated chemicals and materials handling plans, facilities evaluation, groundwater evaluation and protection measures, surface water control and containment facilities information, surface water quality data, hydrologic monitoring plans, detailed climate data to assist in facilities design, geotechnical and geochemical data and analysis, construction schedules including quality assurance and quality control measures, plant and soils analysis, tailings and sludge disposal plans.[227]

The financial assurance amendment required all hardrock mine facilities in Colorado, including prospecting operations, to post a financial assurance equal to the amount necessary for the state to reclaim a site if permit revocation and forfeiture were to occur.[228] The financial assurance amount is calculated during the permitting phase of a mine and updated throughout the life of the mine to account for any changes to the mining or reclamation plans or changes in reclamation costs.[229] As discussed above, DRMS did not calculate site-specific financial assurance prior to the 1993 amendments. As part of the 1993 amendments, language was removed that had allowed sites to be permitted for an established amount (depending on permit type) and language was inserted to mandate that DRMS require, on a site-specific calculation, the total amount of financial assurance necessary for the state to complete reclamation. DRMS now calculates financial assurance amounts during permitting and periodically (at a minimum every four years) through the life of the mine.[230]

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[226] Ibid.
[227] Ibid.
[228] Ibid.
[229] Ibid.
[230] Ibid.

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The MLRA minimizes the adverse impacts of hardrock mining in Colorado by requiring every operator to obtain a permit and adhere to rigorous reclamation standards, both during and after mining.[231] Many of the MLRA's reclamation standards are designed to prevent the release of hazardous substances into the environment.[232] Pursuant to the MLRA, DRMS regulates mining in Colorado to protect the health, safety and welfare of the people of Colorado and to ensure that affected lands are appropriately reclaimed by those operating mines and mills.[233] See Section 34-32-102, C.R.S. Under Section 34-32-109, C.R.S., any operator of a mine or mill must obtain and maintain a reclamation permit. [234]To ensure that reclamation obligations are performed, Section 34- 32-117(1), C.R.S., provides that no mining and reclamation permit may be issued until the Board receives performance and financial warranties.[235] Pursuant to Section 34-32-117(3)(a), C.R.S., a financial warranty consists of a written promise to the Board to be responsible for reclamation costs together with proof of financial capability.[236] Each operator must submit a financial warranty sufficient to assure compliance with applicable reclamation standards, as incorporated in the operation's reclamation permit.[237] See Section 34-32-117, C.R.S. During the life of a mine, DRMS requires financial assurance for water quality treatment, as well.[238]

Under the MLRA, reclamation must be conducted, both during and after the mining operation, in accordance with a reclamation plan that meets certain performance standards. [239]

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[231] Ibid., page 6.
[232] Ibid.
[233] Ibid.
[234] Ibid.
[235] Ibid.
[236] Ibid.
[237] Ibid.
[238] Ibid.
[239] Ibid.

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Many of the reclamation standards are designed to prevent releases of hazardous substances and prevent adverse impacts on surrounding properties. [240] See Section 34-32-116, C.R.S. (requiring measures to minimize disturbance to the hydrologic balance, protect outside areas from damage, and control erosion and attendant air and water pollution).[241] MLRA's financial assurances ensure that DRMS can complete reclamation according to those standards if the operator is unwilling or unable.[242] Regulatory financial assurances require enormous expertise, and must be established by fact-intensive case-by-case review.[243] DRMS calculates the financial assurance amount by developing and aggregating task-by-task cost estimates using current reference materials as well as the regional expertise of its staff. [244] Applicants may submit initial estimates; however, DRMS rigorously reviews those estimates. DRMS is also charged with continuously reviewing the adequacy of financial warranties and uses the same methods.[245]

DRMS and the Board have promulgated a robust set of rules and regulations specific to the oversight of the hardrock mining industry that implement the MLRA.[246] The rules contain specific performance requirements for hardrock mining to protect, for example, both surface and groundwater, impacts to wildlife, and offsite impacts including erosion controls. [247] The rules are evidence of how DRMS minimizes the risk associated with the potential for releases from hardrock mine facilities.[248]

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[240] Ibid.
[241] Ibid.
[242] Ibid.
[243] Ibid.
[244] Ibid.
[245] Ibid.
[246] Ibid., page 7.
[247] Ibid.
[248] Ibid.

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Colorado's regulatory program is predicated on three essential independent but interrelated elements; permitting, inspection and enforcement [249] that allow DRMS to carefully plan for mining and reclamation through the permitting process which is anchored by a thorough financial warranty calculation.[250] It also allows DRMS to periodically review sites through inspections to determine compliance with their permits and, if necessary, take enforcement action to remedy non-compliance.[251]

The permitting process requires prospective operators to, among other things, assess baseline conditions for hydrology, soils, vegetation, land use, climate, geology, and plan for a number of other factors such as chemical and toxic materials handling plans, as they develop their mining and reclamation plans.[252] Many of these plans are required to be certified by a registered professional engineer to ensure design integrity and performance, particularly with respect to any environmental protection facility.[253] A financial warranty is then calculated utilizing the specific factors associated with these plans, including cost details associated with construction of environmental protection facilities and costs associated with demolition and removal of some of these same facilities and structures.[254] Other aspects included in these calculations address volumes of topsoil to be removed and replaced, volumes of overburden to be moved and regraded, waste piles and tailings impoundments to be constructed, capped and reclaimed and types and amounts of vegetation to be reestablished. [255]

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[249] Ibid.
[250] Ibid.
[251] Ibid.
[252] Ibid.
[253] Ibid.
[254] Ibid.
[255] Ibid.

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Once an application is approved and the financial and performance warranties are posted, a permit is issued.[256] Upon permit issuance, the site inspection frequency is determined and the site is inspected at an appropriate frequency throughout its mining and reclamation life. [257] If a violation occurs at a permitted site, this matter is presented to the Board for adjudication which includes finding a violation, possibly issuing a cease and desist order, assessing civil penalties and requiring corrective actions to remedy the violation.[258] Failure by an operator to remedy a violation could lead to permit revocation and, ultimately, financial warranty forfeiture.[259]

Montana

In the state of Montana, hardrock mining is regulated by the Montana Department of Environmental Quality pursuant to the Montana Metal Mine Reclamation Act (MMR Act).[260] The intent of the legislation is to "provide adequate remedies for the protection of the environmental life support system from degradation and provide adequate remedies to prevent unreasonable depletion and degradation of natural resources"[261] and the "proper reclamation of mined land and former exploration areas not brought to mining stage is necessary to prevent undesirable land and surface water conditions detrimental to the general welfare, health, safety, ecology, and property rights of the citizens of the state."[262]

The state legislature has amended the MMR Act several times over the years, including reforms to address bankruptcies of mining companies. For example, in the 1999 legislative session following the bankruptcy of the Pegasus Gold Corp. the previous year, section 82-4-390

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[256] Ibid.
[257] Ibid.
[258] Ibid., page 8.
[259] Ibid.
[260] Montana Code Annotated section 82-4-301 et seq.; available at: http://leg.mt.gov/bills/mca/title_0820/chapter_0040/part_0030/sections_index.html.
[261] Montana Code Annotated, section 82-4-301(2)(a).
[262] Montana Code Annotated, section 82-4-301(3).

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was added to the MMR Act to prohibit open pit mining for gold and silver using the heap leach or vat leach with cyanide ore-processing agents except for certain mines that were already in operation as of November 3, 1998. In another example, section 82-4-338 concerning performance bonding requirements was substantially amended in the 2007 legislative session and now authorizes the Department of Environmental Quality to take action, including accessing the financial assurance bond and suspending the permit, to abate an imminent danger to public health, public safety or the environment caused by violation of this law.[263]

Montana has also enacted state laws to protect water[264] and air[265] quality, to regulate hazardous and solid waste disposal,[266] and to assess environmental impacts.[267] The Department of Environmental Quality has developed regulations implementing the MMR Act that require compliance with the environmental laws contained in Title 75 of the Montana Code. For example, reclamation activities must assure long-term compliance with the air and water quality laws[268] and that operating permits must prevent acid mine drainage through the construction of earth dams or other devises to control water drainage.[269] In another example, permit modifications require an assessment of environmental impacts pursuant to the state equivalent of NEPA.[270]

In its comments on the proposed rule, the Montana Department of Environmental Quality stated that the proposed rule was unnecessary because the state's environmental laws and the

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[263] Montana Code Annotated, section 82-3-338(10).
[264] Montana Code Annotated, Title 75, Chapter 5.
[265] Montana Code Annotated, Title 75, Chapter 2.
[266] Montana Code Annotated, Title 75, Chapter 10.
[267] Montana Code Annotated, Title 75, Chapter 1.
[268] Montana Administrative Rules, 17.24.102(13)(f).
[269] Montana Administrative Rules, 17.24.115(1)(d).
[270] Montana Administrative Rules, 17.24.119.

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MMR Act sufficiently regulate environmental and financial risks posed by current mining operations in the state.[271]

Comments on state mining programs

Freeport-McMoRan Inc. commented that state regulatory programs are comprehensive, staffed by experienced professionals, and effective. In evaluating the risks of hardrock mining EPA did not take into account common elements of current mining regulation, including the detailed, mandatory closure and reclamation requirements designed to restore large land areas disturbed by mining to an appropriate post-mining land uses, the long- term water management requirements designed to protect and, if needed, remediate both groundwater and surface water resources, and operational requirements designed to prevent environmental problems in the first place.[272]

In its comments, the Fertilizer Institute (TFI) stated that, by applying the CERCLA program to facilities covered by existing federal and state reclamation and bonding programs, EPA is duplicating such programs.[273]

Newmont Mining, in its comments, noted that, given the administrative record compiled by the Agency and the excellent job that the FLMAs and States such as Nevada and Colorado already are doing in regulating the risk of unfunded CERCLA releases at hardrock mining facilities, the Agency must conclude that there is no need for another, expensive, duplicative, and preemptive rule to be layered on top of existing regulations.[274]

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[271] See comments of Montana Department of Environmental Quality at EPA-HQ-SFUND-2015-0781-2742.
[272] See comments from Freeport McMoRan Inc, EPA-HQ-SFUND-2015-0781-2793, pages 23-24.
[273] See comments from The Fertilizer Institute, EPA-HQ-SFUND-2015-0781-2633-34, page 63.
[274] See comments from Newmont Mining Corporation, EPA-HQ-SFUND-2015-0781-2712-207, page 195.

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NMA commented that mining is comprehensively regulated by a vast range of federal, state, and local environmental laws and regulations, and that these laws and regulations provide "cradle to grave" coverage of virtually every aspect of mining from exploration to operations through mine reclamation and closure/post-closure.[275]

EPA generally agrees with these commenters that in the proposed rule it did not adequately consider the protectiveness and financial assurance requirements of current state regulatory programs in assessing the "degree and duration of risk associated with the production, transportation, treatment, storage, or disposal of hazardous substances" and the risk that taxpayers will be forced to fund CERCLA response actions, and has based this final action in part upon its more comprehensive consideration of those existing programs.

Protective mining practices

Commenters further argued that new facilities are specifically designed, constructed, operated, and closed in a manner to prevent environmental degradation and to avoid the types of problems that were caused by past practices. The information provided to EPA by commenters emphasized that an assessment of risks of damages to the environment should not focus on mines of an earlier era, and that the targeted regulated universe – currently operating mines using contemporary mining practices – pose comparatively minimal risks of releases.

NMA noted that new facilities are specifically designed, constructed, operated, and closed in a manner to prevent environmental degradation and avoid the types of problems that were caused by past practices.[276] NMA pointed out that historical operating practices that led to the need for largescale CERCLA type responses in the past (e.g., direct disposal of tailings into

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[275] See comments from National Mining Association, EPA-HQ-SFUND-2015-0781-2794, page 28.

[276] See comment from National Mining Association, EPA-HQ-SFUND-2015-0781-2794.

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streams, uncontrolled infiltration/discharge of mine impacted water, discharge of mine waste into dumps or impoundments without mitigating potential release mechanisms, etc.) are no longer utilized by the modern mining industry or compliant with current state and federal regulatory requirements. Rather, NMA notes that the mining industry routinely designs modern mining operations using detailed scientific and engineering investigations such as groundwater and surface water modeling, environmental risk assessments, and stability analyses which contribute to sound design and operating practices intended to protect human health and the environment.

NMA further stated that risks are further reduced at currently operating hardrock mining sites using technologies such secondary containment systems, seepage collection systems, surface water management systems, liners, and active monitoring systems to reduce or eliminate the risk of a release. In the event that a release or potential release is identified through installed monitoring systems, remedial actions are immediately implemented as required by regulatory programs using technologies such as interceptor wells, cutoff walls, and hydraulic capture zones.[277]

NMA stated that as federal and state mining programs and groundwater protections have matured, monitoring, reporting, and corrective action have become core components of hardrock mining programs and permits, citing, for example, BLM's current regulations, promulgated in 2001, which require operators to submit a comprehensive monitoring plan that demonstrates compliance with BLM's surface management regulations and other Federal and State environmental laws and regulations, provides early detection of potential problems, and supplies information that will assist in directing corrective actions should they become necessary.[278]

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[277] Ibid., Appendix B.
[278] See 43 C.F.R. 3809.401(b)(4).

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Numerous other commenters, including MiningMinnesota, AEMA, Energy Fuels Resources, and General Moly, Inc. supported NMA's views, noting that advances in engineering controls, technology, mining industry best practices, and FLMA and state regulatory programs have lowered the "degree and duration of risk" to a point that CERCLA 108(b) financial responsibility requirements are not required.[279] These commenters further elaborated that the FLMA and state mine regulatory and financial assurance programs coupled with engineering controls and best practices reduce the degree and duration of risk associated the production, transportation, treatment, storage, or disposal of hazardous substances and that these FLMA and state reclamation and closure requirements require more than simply reshaping land and revegetation – by requiring a mine to be designed, built, operated and closed to prevent the release of hazardous substances and ensure no adverse environmental impacts through the entire mine life cycle, including closure and post-closure. As such, the commenters believe no additional financial responsibility requirements are necessary to protect the taxpayers or the Superfund Trust Fund.

The Idaho Mining Association (IMA) echoed the same message, noting that modern mining techniques and best practices in the mining industry use technology and appropriate controls in combination with FLMA and state programs to lower risk of release such that EPA's proposed rule is not necessary.[280]

For the planned Donlin Gold project in Alaska, Calista Corporation noted in its comments that one of the primary goals has been to avoid environmental and human health risks both from planned operations and potential unanticipated releases of hazardous substances such

[279] See comments from MiningMinnesota, EPA-HQ-SFUND-2015-0781-2655 and from American Exploration and Mining Association (AEMA), EPA-HQ-SFUND-2015-0781-2657, and General Moly, Inc, EPA-HQ-SFUND-2015-0781-2715.

[280] See comment from the Idaho Mining Association, EPA-HQ-SFUND-2015-0781-2772.

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as tailings, acid rock drainage, mercury, cyanide, and fuel oil. For example, the Donlin Gold tailings storage facility design is state-of-the-art and includes: (1) downstream, rock fill dam construction keyed into bedrock, (2) a geo-synthetic liner, and (3) dry closure to minimize long-term water management needs.[281]

Freeport-McMoRan provided numerous specific examples of how the hardrock mining industry has improved its management of environmental impacts:

- In the area of managing the acidic content of waste rock, the industry employs a far more sophisticated and technology-driven approach that includes a thorough geochemical analysis of the ore reserve body being mined. Using up-to-date information, trucks equipped with GPS systems are routed to specific designated disposal locations based on the acidic potential of the waste rock. These locations in turn are selected based on geochemical modeling that can project out far into the future. Potentially acid-generating material is disposed of in engineered facilities designed to minimize the potential for acid generation by encapsulation or neutralization and thereby reducing the potential for acid rock drainage and seepage.
- The changes to the design and operation of tailings ponds over the last 25 years are also quite extensive. At the operational level, qualified internal tailings-dedicated engineers and onsite leaders manage tailings stability. Sites with tailings dams follow established operations, maintenance and communication protocols. In this process, items regularly inspected and monitored are: phreatic level trends, deposition plans and adherence to good operational construction practices, water management controls (including pool sizes

[281] See comment from Calista Corporation, EPA-HQ-SFUND-2015-0781-2644.

and location relative to dam faces), seepage management, decant systems and other stability components.

- Prior to the revisions to state mining programs during the late 1980s and into the early 1990s, it was not uncommon for waste rock stockpiles, tailings impoundments, leach pads and ponds to be built with limited or no engineering and design review, limited quality control and questionable operational practices. For example, some leach pads were built on somewhat compacted sub-grade overlain with solvent welded poly-vinyl chloride (PVC) plastic sheeting, many times installed by mine site employees without specific expertise in the construction of these systems. These pads usually had ditches lined with Hypalon sheeting due to this material's superior ultraviolet light resistance compared to PVC. Many of these sites have been decommissioned, closed, and replaced by more environmentally robust options.
- Modern tailings disposal facilities are engineered and constructed utilizing environmental protection controls. These facilities are constructed utilizing geologic containment or engineered liners to contain the fluid portion of the tailings. As time passes following deposition, the solid fraction of the tailings consolidates, reducing the interstitial pore space and thereby decreasing the hydraulic permeability to a value that is often less than the liner material used during construction. These facilities are often equipped with controls, such as barge pump back systems and containment/collection wells at the toes of the units, to capture any seepage and allow for the recycling of captured water. Upon closure, these facilities take measures to minimize net infiltration into the tailings, such as by utilizing stormwater controls and ensuring that there is positive drainage during storm events. Tailings facilities are also covered and revegetated to produce a passive

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evapotranspiration mechanism which further reduces net infiltration. These tailings disposal facilities are operated following Tailings Management Plans which are included in the application for environmental protection permits issued by state regulating agencies.

- Prior to the placement of waste rock, the proposed site is evaluated for environmental risks including upstream stormwater run-on, seeps and springs upwelling from beneath the proposed facility, proximity to streams and rivers and other site specific exposures. The waste rock facility must be designed and built in accordance with engineering and construction details required by a mine's state- issued permit, which must be based on geotechnical stability analyses. Stormwater management measures, such as diversion features to intercept water and direct it around the waste rock facility, and facility management plans that govern the placement of potentially-reactive material are also employed to limit contact with potentially acid-producing materials. Other management strategies that may be employed to limit contact with potentially acid-generating material may include blending with neutralizing rock, segregation in cells that are set back a prescribed distance from the base and edges of the facility and are covered or encapsulated in neutralizing material, and landform design to minimize stormwater ponding. Concurrent reclamation is also often incorporated to further reduce the potential for net infiltration into the waste rock facility and return the area to a productive post-mining land use. Waste rock facility inspections by the operator and regulatory inspectors are also performed on schedules based upon regulatory requirements imposed by laws, regulations and permit stipulations. These inspections include looking for seepage from the facility, slope stability, stormwater ponding and other prescribed conditions. Any

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issues observed must be corrected per the regulatory and permit requirements imposed. These inspections are conducted during operation and continue through the closure period following reclamation of the facility.

Several commenters also commented on the usefulness of environmental management systems (EMSs) and best management practices (BMPs). For example, NMA commented that the introduction of EMSs in the 1990s was another key development for improved environmental performance - a framework that helps an organization meet its regulatory compliance requirements and otherwise achieve its environmental goals through consistent review, evaluation, and improvement of its environmental performance.[282] This consistent review and evaluation are intended to identify opportunities for continuous improvement in the environmental performance of the organization. NMA states that many HRM facilities have implemented EMS programs, noting that at EPA's request, it, in association with the Society for Mining, Metallurgy, and Exploration ("SME"), developed a model EMS guide to address the agency's concerns about the ability of smaller and medium size mining companies to develop and implement EMS programs. The objective of the EMS guide is to assist companies in achieving reliable regulatory compliance, reducing adverse impacts to the environment, improving environmental stewardship, and continually improving environmental performance. NMA notes the most commonly used framework for an EMS is the one developed by the International Organization for Standardization ("ISO") for the ISO 14001 standard. Established in 1996, this framework is the official international standard for an EMS and includes an optional third-party certification component, meaning an independent certification body audits an organization's practices against the requirements of the standard. Many HRM facilities have

[282] See comment from National Mining Association, EPA-HQ-SFUND-2015-0781-2794.

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taken this extra certification step. The ISO 14001, first published in 1996, underwent significant revisions in both 2004 and 2015.

Freeport-McMoRan similarly commented that EPA did not consider the implementation of EMSs - under standards developed by reputable third-party organizations, such as the International Standards Organization and the International Council on Mining and Metals.[283] The commenter noted that such standards commit participants to continuing process improvement above and beyond minimum legal requirements. Likewise, standards for sustainability, such as ICMM's, require third party assurance and verification programs. Freeport-McMoRan stated these private initiatives supplement state programs, adding an additional layer of best practices and external review above and beyond what is legally required. The Arizona Department of Environmental Quality (ADEQ) supported this approach, noting the usefulness of its Voluntary Environmental Stewardship Program (VESP) and Voluntary Remediation Program (VRP) that are innovative systems not based on enforceable commitments required for reductions.[284] ADEQ also stated the usefulness of EMSs, ISO certification, third party inspection programs, or similar types of state and federal programs for reducing risk from mining operations and specifically noted that Freeport-McMoRan, with mines in Arizona, employs industry best practices of an ISO14000 environmental management system.

With respect to BMPs, the Forest Service commented that EPA acknowledges that "[t]oday, BMPs have been developed that can mitigate potential impacts from mining to meet EPA's goal '...that the engineering requirements will result in a minimum degree and duration of risk associated with the production, transportation, treatment, storage, or disposal, as applicable,

[283] See comment from Freeport-McMoRan, EPA-HQ-SFUND-2015-0781-2793.
[284] See comment from the Arizona Department of Environmental Quality (ADEQ), EPA-HQ-SFUND-2015-0781-2714.

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of all hazardous substances present at that site feature.[285] However, comments submitted by Earthworks, *et al.* raise concern about the use of BMPs, noting that no data was provided to demonstrate that these rules have reduced, or prevented, releases of hazardous materials. Earthworks further noted that numerous reports document substantial impacts at modern hardrock mines, particularly those associated with the release of hazardous materials.[286]

EPA recognizes that substantial advances have been made in the development of mining practices and the implementation of federal and state regulatory programs to address releases at hardrock mining facilities. While the risk of a release is never totally eliminated, commenters provided information regarding state regulation of hardrock mining facilities, including detailed information on controls those programs require to prevent releases. This information indicates that state and voluntary programs improve in response to incidents. Barrick Gold commented that EPA cited some releases including at the Summitville and Zortman-Landusky mines, which the commenter stated cannot occur again because federal land management agencies and state regulators have strengthened requirements and practices to prevent the issues that occurred previously. Specifically, they stated that regulations and policy were modified to more carefully identify risks of acid rock drainage or other water contamination, to control potential sources though mine design and to assure those measures are implemented through permit and monitoring obligations. The Colorado Department of Natural Resources, Division of Reclamation, Mining, and Safety's comments support Barrick's statements, stating that "the state learned from the errors at Summitville, and the state legislature passed major programmatic revisions to the Mined Land Reclamation Act (MLRA)" that "strengthened permitting and

[285] See comment from USDA Forest Service, EPA-HQ-SFUND-2015-0781-2400.
[286] See comment from Earthworks *et. al*, EPA-HQ-SFUND-2015-0781-2739.

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enforcement provisions. Most importantly, the MLRA was specifically amended [...] to clearly require financial assurance for all sites based on site specific, not formulaic, criteria." [287]

The Nevada Mining Association's comments reference Nevada's continual improvement of its regulatory programs to ensure effectiveness and efficiency. This comment argues that state programs are not static and rather make constant improvements. [288] Comments from the Small Business Administration Office of Advocacy explained that the bonding requirements of the Nevada program have been more recently upgraded, in part, because of the experience gained from administering mines through bankruptcies in the early 1990s[289] NMA notes improvements to federal and state programs made in response to bankruptcies in the mining industry experienced in the 1990s and early 2000s [290] One coordinated improvement of Federal Land Management Agencies and Nevada cited is the development of the SRCE mentioned above.

Additionally, a commenter operating in several states stated that EPA's evaluation of risk failed to consider important aspects of modern mining, including the deployment of voluntary industry programs (e.g., the International Council on Mining and Metals (ICMM) Sustainable Development Framework) and robust environmental management systems with third-party certification. [291] A commenter also noted the International Cyanide Management Code for the Manufacture, Transportation, and Use of Cyanide in the Production of Gold, which was developed under the guidance of the United Nations Environment Program. The code "focuses exclusively on the safe management of cyanide and cyanidation mill tailings and leach solutions. Companies that adopt the Cyanide Code must have their mining and processing operations that

[287] See comment from Colorado Department of Natural Resources, EPA-HQ-SFUND-2015-0781-2774, page 3.
[288] See comment from the Nevada Mining Association, EPA-HQ-SFUND-2015-0781-2684, page 7.
[289] See comment from the Small Business Administration, EPA-HQ-SFUND-2015-0781-1406, page 4.
[290] See comment from the National Mining Association, EPA-HQ-SFUND-2015-0781-2794, page 64.
[291] See comment from Freeport-McMoRan Inc., EPA-HQ-SFUND-2015-0781-2402.

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use cyanide to recover gold and/or silver audited by an independent third party to determine the status of Cyanide Code implementation." The requirements under the code include storage and mixing location and containment, secondary containment, lining for leach ponds, and spill prevention and containment.[292] Similarly, another commenter stated that EPA failed to adequately recognize the impacts of the development and adoption of industry BMPs, other voluntary programs, and environmental management systems. [293]

EPA acknowledges that the requirements of current federal and state programs can reduce risk at hardrock mining facilities, and that when determining the need for section 108(b) requirements for hardrock mining facilities at proposal, EPA did not adequately consider their impact. EPA agrees with commenters opposing the proposed rule that those reductions in risk should be considered in determining the need for final requirements under section 108(b) for current hardrock mining operations.[294] The Agency is thus convinced by those commenters and its own further investigations that the rulemaking record supporting requirements under section 108(b) for currently operating facilities was incomplete in not adequately considering the risk reductions currently obtained by other Federal and state regulatory programs. While EPA also acknowledges that the risk of a release is never totally eliminated by the requirements of other programs, this residual risk is to be evaluated in light of EPA's discretion under the statute on whether to set section 108(b) requirements, and in light of the other information in the record for today's action discussed elsewhere in this final rule. Viewed in this manner, such residual risk

[292] See Id., Appendix D page at 8.
[293] See comment from National Mining Association, EPA-HQ-SFUND-2015-0781-2794.
[294] As discussed above, this determination applies only to EPA's authority under section 108(b) and does not affect EPA's authority to take action under other sections of CERCLA or under other federal law at any facility, including at a facility discussed in this preamble.

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does not change EPA's conclusion that it is not appropriate to issue final section 108(b) requirements for current hardrock mining operations.

Finally, it should be noted that in addition to the federal and state mining programs that regulate mine operation and closure, hardrock mining facilities are regulated under a number of other federal programs, discussed above, which contribute to reduction in risk at these facilities. For example, mines are generally required under the Clean Water Act regulations to obtain NPDES permits, and to meet federal water quality standards for point-source discharges to water sources from industrial operations. Requirements of the Safe Drinking Water Act include permitting and technical standards for underground injection wells that might be used in mineral extraction. And, requirements under the CAA apply National Emission Standards for Hazardous Air Pollutants to hazardous air releases from mining and processing operation sources.

b. Comments Providing Information on Reduced Costs to the Taxpayer Resulting from Effective Hardrock Mining Programs and Owner or Operator Responses

Commenters also argued that the reduced risk at modern hardrock mining facilities is evidenced by the fact that there are very few cases where modern hardrock mining facilities have been addressed by Superfund and/or at taxpayer expense.

Several commenters disagreed with EPA's assertion in the proposal that the estimated $4 billion spent by EPA through the Superfund for cleanup costs at historical hardrock mining facilities is an indication of the relative risk present at the facilities covered by the proposed rule. Commenters stated that EPA did not differentiate between costs associated with the highly-regulated mining practices of today and pre-regulation practices in developing that number. EPA agrees that the analysis discussed in the preamble to the proposed rule[295] did not adequately distinguish between legacy and current mines.

[295] See 82 FR 3479, January 11, 2017.

Commenters argued that such analyses would further demonstrate that any risks from modern operations entail much less costly responses, and that the bulk of the observed historical response costs are attributable to pre-regulation practices.

In addition, many commenters stated that the risk that there will be inadequate funding to cover CERCLA liabilities at hardrock mining facilities in the future is adequately addressed by existing federal and state financial assurance programs. Commenters provided numerous examples of existing trust, bonds, and letters of credit (LOCs) available to pay for necessary actions at these sites.[296] Commenters also provided examples of facilities where the response costs have been paid for by owners and operators at no cost to taxpayers.[297]

Since a goal of section 108(b) requirements is to provide funds to address CERCLA liabilities at sites, evidence of such privately-funded responses contributes to support for the decision that financial responsibility requirements under section 108(b) for current hardrock mining operations are not appropriate.

E. Evidence Rebutting EPA's Site Examples

In developing the 2009 Priority Notice and the proposed rule, EPA cited examples of hardrock mining facilities where releases of hazardous substances have occurred, and in some cases where CERCLA or CERCLA-like actions were necessary, as evidence of risk associated with hardrock mining operations.[298] The examples fell into three categories: (1) examples now not relevant to the mines to be regulated under the rule, (2) examples reflecting a reassessment of

[296] See a discussion of this issue in the Technical Support Document for this final rule: EPA, CERCLA Section 108(b) Hardrock Mining Final Rule: Technical Support Document, December 1, 2017.
[297] See a discussion of this issue in the Technical Support Document for this final rule, Ibid.
[298] *See* the Releases Report, the Practices Report, and the Evidence Report. NMA comments included a detailed critique of the Practices Report prepared by the Society for Mining Metallurgy and Exploration, Inc., as Appendix D to its comments.

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costs to the taxpayers based on new information, and (3) examples where program requirements were subsequently modified to address the problem.

Commenters on the proposed rule provided information to rebut the facts associated with the case studies and their significance in support of the 2009 Priority Notice and the proposed rule, by pointing out that response actions were due to legacy contamination, were privately funded, were covered by financial assurance under other law, or were the result of situations that have been subsequently addressed by state law.[299] The information provided by these case studies formed a significant portion of the record on which the 2009 Priority Notice and the proposed rule were based. This additional information provided by commenters has caused EPA to reevaluate its conclusions in the proposed rule regarding the level of potential taxpayer liability from modern mines operating under currently existing regulatory programs.

One example in each of the three categories is discussed below. A full discussion of the case studies and the evidence provided in rebuttal can be found in a support document entitled "CERCLA Section 108(b) Hardrock Mining Final Rule: Technical Support Document," which is available in the docket for this rulemaking.

1. Example of Sites Now Not Relevant to the Mines to be Regulated under the Rule

Commenters provided information demonstrating that several of the site examples relied upon in the proposed rule are not relevant to an evaluation of the risk at current hardrock mining operations because they relate to historic mining activities that do not reflect current mining practices or regulatory regimes at the state or federal level. EPA agrees that the historical mining practices, and environmental contamination that may have occurred as a result of such practices, are not an accurate representation of the risks associated with current hardrock mining

[299] In fact, comments submitted by NMA included a lengthy Appendix addressing the individual facilities cited by EPA. See comment EPA-HQ-SFUND-2015-0781-2794, Appendices C-1, C-2, and C-3.

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operations. Many of the sites referenced in the proposed rule, the 2009 Priority Notice, and record of support, are not relevant to EPA's assessment of risk posed by current hardrock mining operations that are already subject to applicable federal and state regulatory regimes. Rio Tinto Kennecott Bingham Canyon Site in Utah is an example of a site that was now not relevant to current hardrock mining operations.

This mine was included in the preamble of the proposed rule as an example of the impacts that can occur from large-scale operations.[300] For example, the discussion of this mine references the large-scale disturbance of land, accumulation of waste rock, and leaching of hazardous substances and acid rock drainage, but it does not provide details about the history of the mine or context about whether certain activities are best characterized as legacy mining activities or ones that reflect current mining practices and regulatory regimes.

According to Rio Tinto's comments and EPA's record for the site, there has been active mining in the canyon since the 1860s and that the historic mining activities "based on a less sophisticated understanding of environmental sciences and substantially less regulation by emerging environmental protection laws inarguably left their mark."[301] According to the record for this action, EPA has secured more than $270 million to pay for response actions for this site through enforcement orders and consent decrees. Rio Tinto in its comments acknowledges that accidents do happen and that reporting, inspections, and enforcement can help prevent and

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[300] 82 FR 3388, 3472; see also, Comment submitted by Earthworks (EPA-HQ-SFUND-2015-0781-1072). The four-page report characterizes the mine as the "second most polluting mine in the US by toxic releases" based on TRI data; however, as noted the preamble to the final rule, TRI data are not an accurate representation of risk at a particular site. As the Earthworks comment notes, EPA and the state have reached an agreement to not finalize the proposal to list the site on the NPL and there have been several state and federal regulatory and enforcement actions at the site, which required the company to take steps to mitigate risks to human health, water, and other natural resources.

[301] EPA-HQ-SFUND-2015-0781-2747; see also, EPA-HQ-SFUND-2015-0781-0186.

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address problems that do occur. In its comments, NMA stated that the cooperation between the mining company, EPA, and the state is a model for addressing legacy environmental contamination at mining sites.[302] EPA has touted the cooperative effort to clean up the site as a "major accomplishment of the Superfund program and law."[303] Further discussion of this mine can be found in the Technical Support Document for this final rule.[304] EPA agrees that this mine, which has an expansive footprint but whose current operations are subject to considerable oversight by regulatory authorities, is not a relevant example on which to base a rule under section 108(b).

2. Example Reflecting Reassessment of Costs to the Taxpayers Based on Additional Information

As discussed above, a goal of regulations under section 108(b) is to increase the likelihood that owners and operators will provide funds necessary to address the CERCLA liabilities at their facilities. In doing so, section 108(b) requirements assure that owners and operators, rather than the taxpayers, bear the costs associated with necessary responses to releases and potential releases of hazardous substances at their sites. Commenters on the proposed rule objected that EPA did not properly consider whether a release resulted in expenditure of taxpayer funds to determine the need for a rule under section 108(b). EPA's reconsideration of these case studies supports the determination that section 108(b) financial responsibility requirements at hardrock mining facilities are not necessary to provide funds to address CERCLA liabilities at sites. Many of the sites referenced in the proposed rule, the 2009 Priority Notice, and record of support, are not relevant to EPA's assessment of risk posed to the

[302] EPA-HQ-SFUND-2015-0781-2794, table C.
[303] See comment from the National Mining Association, EPA-HQ-SFUND-2015-0781-2747, Appendix F.
[304] See: EPA, CERCLA Section 108(b) Hardrock Mining Final Rule: Technical Support Document, December 1, 2017.

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taxpayer because cleanup is being paid for by private parties. Golden Sunlight Mine in Montana is an example of such a site.

The Releases Report presented this mine as an example of a current mine with releases to the environment where a response action was necessary. NMA and Barrick Gold both commented that the releases from the tailings facility detected in 1993 were discovered by monitoring implemented at the behest of state mining permits at the site and corrective action was taken by the operator.[305] In the proposed rule, the agency described the actions by the owner/operator to immediately repair the bentonite cut-off wall to control seepage from the tailings impoundments. The facility has also installed an extensive system of monitoring wells and several hydrogeologic investigations have been undertaken to continue to monitor, evaluate, and control leakage from the tailings impoundment.

As discussed in the Technical Support Document and elsewhere in the preamble, Montana substantially reformed its mining laws over the past couple of decades. Montana Department of Environmental Quality commented on the proposed rule that Montana State Law "requires Hard Rock operators to submit to Montana Department of Environmental Quality a bond in an amount no less than the estimated cost to the state to ensure compliance with Montana's Air Quality Act, Montana's Water Quality Act, the Metal Mine Reclamation Act, and the permit issued by DEQ under the Metal Mine Reclamation Act (MMRA). The site is also subject to Montana's Environmental Policy Act (MEPA) which is patterned after NEPA). The mine has been the subject of several environmental assessments and one environmental impact statement for amendments to its operating permit. In addition, and at a minimum, Montana

[305] National Mining Association comments on proposed rule appendix table C-2 pg 6; Barrick Gold July 11, 2017 comments on proposed rule page 20.

Department of Environmental Quality is required to perform a comprehensive bond review every five years for each Hard Rock operation to ensure that the bonding level is appropriate."[306]

The Agency researched Montana's requirement to perform a comprehensive bond review every five years as it applies to the Golden Sunlight Mine. The agency found a final bond determination for Golden Sunlight Mine dated July 28, 2017 in which Montana DEQ determined that the current bonding level of $112,153,980 did not represent the present cost of compliance with the MMRA, the administrative rules, and Operating Permit No. 00065. After negotiations between Montana Department of Environmental Quality, the Bureau of Land Management, and the mine owner, and a 30-day comment period, the bond amount was increased to $146,564,163. The next comprehensive bond review will be in 2020.[307] Further discussion of this mine can be found in the Technical Support Document for this final rule.[308]

3. Example Where Program Requirements Were Subsequently Modified to Address the Problem

Commenters provided information to demonstrate that when problems have arisen at hardrock mining facilities, states have responded by improving their programs to prevent similar problems in the future and that there is, therefore, no need for financial responsibility requirements under section 108(b). Commenters provided examples of such state program modifications to rebut evidence provided in the record supporting the proposed rule. Barite Hill/Nevada Goldfields Facility in South Carolina is an example of a situation where program modifications reduced future risk.

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[306] EPA-HQ-SFUND-2015-0781-2742.

[307] See: EPA, CERCLA Section 108(b) Hardrock Mining Final Rule: Technical Support Document, December 1, 2017. 2017. http://deq.mt.gov/Portals/112/Land/Hardrock/Active%20Amendments/Golden%20Sunlight%20016/00065_GSM_2017_07_28_Final_Bond.pdf

[308] See: EPA, CERCLA Section 108(b) Hardrock Mining Final Rule: Technical Support Document, December 1, 2017.

As was discussed in the proposed rule, the Barite Hill/ Nevada Goldfields was a gold and silver surface mine located in McCormick, South Carolina that was operated by Nevada Goldfields.[309] The mine operated an open pit cyanide heap leach operation on the property from 1989 to 1994. Nevada Goldfields conducted mine reclamation activities from 1995 to 1999, when it filed for bankruptcy and abandoned the site, turning over control to the South Carolina Department of Health and Environmental Control.[310]

NMA commented that EPA's description of the mine in the proposed rule included mischaracterizations and omissions, including that significant changes were made to South Carolina Mining Act in 1990 that specified reclamation requirements and provided enforcement tools. NMA also stated that the most recent facility that had been permitted in the state had a waste rock management plan to prevent acid mine drainage.[311] EPA has confirmed that South Carolina finalized regulations implementing this new authority in 1992, including requirements that a mine obtain a reclamation bond as a condition for receiving a mining permit, and that the recently permitted gold mine is subject to stricter environmental and financial assurance requirements.[312] These regulations were not completed in time to significantly reduce risks at Nevada Goldfields, which ceased active mining in 1994, but EPA believes that similar mines operating in South Carolina today under the current regulations would have significantly reduced risks of unpermitted releases and taxpayer liability. Further discussion of this mine can be found in the Technical Support Document for this final rule.

F. Information Regarding Financial Responsibility Instrument Availability

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[309] 82 FR at 3473.

[310] ATSDR 2011 PHA Barite Hill EPA-HQ-SFUND-2015-0781.

[311] NMA EPA-HQ-SFUND-2015-0781-2794 Attachment #109 pdf p. 81/119; Attachment #110 pdf p. 330, 346, and 387/440

[312] S.C. State Register, Vol. 16, Issue 4 (April 24, 1992); available at: http://digital.tcl.sc.edu/cdm/compoundobject/collection/scsreg/id/31138/rec/5.

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During the public comment period for the proposed rule, commenters representing or participating in the insurance, surety and banking industries identified several concerns with EPA's proposed instrument terms, and expressed concern that those terms could impact the availability of instruments. Similarly, entities in the mining industry expressed concerns that instruments may not be available for the amounts proposed in the forms specified. Information provided by commenters on likely lack of available instruments to satisfy section 108(b) requirements provides further support for EPA's determination that the proposed financial responsibility requirements are not appropriate.

EPA considered the capacity of the financial market to provide instruments as part of the development of the proposed rule. The Conference Committee Report for the Consolidated Appropriations Act (2016) instructed EPA to conduct a study of the market capacity regarding the necessary instruments for meeting any new section 108(b) financial responsibility requirements. EPA accordingly developed a study,[313] which suggested significant uncertainty exists around the ultimate availability of instruments.

Many commenters expressed concerns regarding the uncertainty inherent in the study as well and expressed concerns that financial responsibility instruments may not be universally available and affordable.[314]. The concerns raised by commenters regarding the terms and

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[313] Doc. ID EPA-HQ-SFUND-2015-0781-0496; Letter from USEPA, Chief Financial Officer, to members of Senate and House Subcommittees on Interior, Environment, and Related Agencies, dated Sept. 1, 2016, along with attached submission of EPA study titled, "CERCLA 108(b) Hardrock Mining and Mineral Processing Evaluation of Markets for Financial Responsibility Instruments, and the Relationship of CERCLA 108(b) to Financial Responsibility Programs of Other Federal Agencies", August 25, 2016.

[314] See, for example, Freeport McMoran comments on the proposed rule Docket ID: EPA-HQ-SFUND-2015-0781-2793 pg 89-91; American Exploration and Mining Association comments on the proposed rule Docket ID: EPA-HQ-SFUND-2015-0781-2795 pg 30-32; National Mining Association comments on the proposed rule Docket ID: EPA-HQ-SFUND-2015-0781-2794 pages 81-82.

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conditions of the proposed instruments as well as the comments on the market capacity study have contributed to uncertainty regarding the availability of instruments to owners and operators seeking to comply with the proposed section 108(b) requirements. If instruments were not available, owners and operators would be unable to comply with section 108(b) requirements, and the goal of the rule to provide funds to address CERCLA liabilities at sites would not be achieved.

The issue of availability of instruments is discussed in more detail in section VII.D. of this final rule.

V. Decision to not Issue the General Facility Requirements of Subparts A through C in this Final Rule

The Agency also has decided not to issue as final any provisions of the proposed rule, including the general financial responsibility requirements in subparts A through C. EPA would include general facilities requirements, such as these, in the first of any subsequent rulemaking proposals under section 108(b), rather than issue final requirements under those subparts at this time.

EPA decided on this approach because there is no need to issue final requirements in subparts A through C at this time as they would not be applicable to any classes of facilities until such time as final section 108(b) regulations applicable to classes of facilities are issued.

In addition, the Agency received significant comment on the general financial responsibility provisions of the proposed rule, many of which identified significant issues with those portions of the proposal. These included, for example, the financial industry's concerns regarding certain provisions included with the language of the instruments, as described in detail below. By issuing a new proposed set of general requirements for any subsequent industry class, EPA would to be able to gather additional information as appropriate. Accordingly, EPA would be able to present a new set of general facility requirements in any subsequent proposal, with an additional opportunity for public comment, rather than having to create a proposal to modify existing requirements, thus avoiding potential confusion to commenters.

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VI. Obstacles to Developing and Implementing Section 108(b) Financial Responsibility Requirements for Hardrock Mining Facilities

EPA decided not to issue a final rule under section 108(b) for hardrock mining facilities because the Agency believes that final regulations are not appropriate. Furthermore, the Agency encountered a set of challenges that validate the decision not to issue final regulations. First, challenges remain regarding the potential disruption of state, tribal, and local mining programs by section 108(b) requirements. Second, section 108(b) continues to present particular challenges regarding the determination of a financial responsibility amount. Third, the Agency's evaluation of the economic impacts of the proposed rule does not support the need for a rule. Fourth, concerns regarding the availability of instruments remain. Finally, section 108(b) continues to present challenges in identifying the facility for purposes of the rule. These concerns were raised by commenters, and are discussed in detail below.

A. Potential Disruption of State, Tribal, or Local Mining Programs

In the proposed rule, EPA acknowledged the role that effective reclamation and closure requirements at hardrock mining facilities under federal and state programs can have in reducing the likelihood of releases or potential releases of hazardous substances to the environment. EPA also documented that federal and state mining regulatory programs require financial assurance to support implementation of reclamation and closure requirements.

Numerous observers raised questions about the effects of an express preemption provision in CERCLA section 114(d) during EPA's development of the proposed rule. This provision states in part:

> Except as provided in this subchapter, no owner or operator of a . . . facility who establishes and maintains evidence of financial responsibility in accordance with this subchapter shall be required under any State or local law, rule or regulation to establish or maintain any other evidence of financial responsibility in connection with liability for the release of a hazardous substance from such . . . facility.

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> Evidence of compliance with the financial responsibility requirements of this subchapter shall be accepted by a State in lieu of any other requirement of financial responsibility imposed by such State in connection with liability for the release of a hazardous substance from such . . . facility.[315]

EPA discussed its views on the preemption provision in the proposed rule. Specifically, EPA explained that it did not intend for its section 108(b) regulations to result in widespread displacement of state mine bonding programs under section 114(d), nor did it believe that such preemption is intended by CERCLA, necessary, or appropriate. In support of this conclusion, EPA discussed the language of paragraph (d) and section 114 as a whole, and considered whether state bonding programs were "in connection with liability for the release of a hazardous substance" as that term is used in section 114(d), and also took into account relevant policy considerations.[316]

Commenters on the proposal nevertheless continued to express concern that preemption would indeed occur if section 108(b) requirements were implemented at facilities, resulting in disruption of those programs not only from successful preemption challenges, but also from the mere need to defend against those challenges.[317]

Although EPA discussed its views on the question in the proposed rule, it will be the courts, rather than EPA, that will decide the effect of section 114(d). Thus, EPA cannot ensure that preemption will not occur if financial responsibility under section 108(b) requirements is in place at a facility. EPA thus understands why states and local governments have concerns that

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[315] 42 U.S.C. § 9614(d).
[316] 82 FR 3403-04.
[317] See, for example, Montana Dept. of Environmental Quality, Comment #: EPA-HQ-SFUND-2015-0781-2742; Arizona Dept. of Environmental Quality (ADEQ), Comment #: EPA-HQ-SFUND-2015-0781-2714; and State of Alaska (Dept. of Natural Resources (ADNR), Dept. of Environmental Conservation (ADEC), and the Alaska Dept. of Law), Comment #: EPA-HQ-SFUND-2015-0781-2785.

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they would have to defend preemption challenges, and concerns over the possibility that preemption could occur.

EPA also recognizes that the potential impact of preemption of financial assurance requirements extends beyond the concerns relating to the financial impacts, as financial assurance is an integral part of state mining programs – that is, financial assurance can provide enforcement leverage to regulators, and can prevent delays in conducting closure and reclamation at a site should the owner or operator become unwilling or unable to do so, thus minimizing environmental harm.

For all of these reasons, EPA believes that preemption of state financial assurance requirements, should it occur, would be an undesirable and damaging consequence of section 108(b) requirements. The Agency's decision not to issue final requirements under section 108(b) for hardrock mining facilities avoids this undesirable outcome.

B. Challenges to Determine the Level of Financial Responsibility

In developing the proposed rule, EPA considered four approaches to identify a financial responsibility amount for a facility -- fixed amount, site-specific amount, parametric approach, and formulaic approach, and described three of those approaches in the proposed rule. EPA also identified some of the challenges of the three approaches described and sought comment on various aspects of these approaches.

Under a fixed amount approach, the Agency would identify a standard cost for the class of regulated facilities. This method would not rely on site-specific factors but rather on historical costs associated with similar facilities to calculate an expected future amount. This approach is best applied where the costs at issue are fairly uniform, as the wider the variation, the lower the accuracy of the financial responsibility amount for that cost. If there is wide variation in the

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costs associated with the facilities within the class to which the fixed amount is applied, the result can be significant over-regulation at those facilities with lower levels of liabilities, and significant under-regulation of facilities with higher levels of liabilities. At the same time, this approach has advantages in that it requires a lower level of effort on the part of the regulated community and the Agency to implement because the rule does not require a site-specific calculation to be developed, submitted, or evaluated. EPA proposed the use of a fixed amount for the health assessment component of the financial responsibility amount from hardrock mining facilities.

The second method considered by EPA was a site-specific approach. Under this approach, the owner or operator would calculate the cost of conducting known activities to address identified problems. This approach is the most precise of the three approaches considered by EPA. However, it is also the most resource intensive to implement. It requires gathering detailed information about the site, including an assessment of the site conditions, and is most easily implemented where a release has occurred, a response is necessary, and a remedy determination has been made. In fact, EPA already requires financial responsibility identified on a site-by-site basis when requiring parties to carry out response actions under CERCLA.[318] EPA notes that state regulatory programs and the programs of BLM and the Forest Service generally do use a site-specific approach based on extensive knowledge of site conditions to establish financial responsibility amounts, and this is one of the strengths of existing programs relative to the formula based approach in the proposed rule. Having identified reasons that a fixed cost and a site-specific approach may not be appropriate to identify the level of financial responsibility under section 108(b) for response costs and natural resource damages

[318] See Guidance on Financial Assurance in Superfund Settlement Agreements and Unilateral Administrative Orders (April 2015).

for hardrock mining facilities, EPA sought to develop an approach that was more accurate than the fixed amount, yet could be implemented without conducting a full site investigation at the facility. The Agency's efforts resulted in development of a formula for facilities within the hardrock mining industry.

The proposed formula identified categories of response action at hardrock mining facilities, based on past response actions to legacy contamination and estimated the costs of those actions based on reclamation activities under federal and state laws. Instead of taking other regulations or facility practices into account when identifying the risk to be addressed by financial responsibility requirements, the formula assumed the need for a CERCLA response, and then allowed reductions in the financial responsibility amount based on a demonstration of compliance with other regulatory requirements or other facility practices. As discussed above, EPA no longer believes that this approach would result in financial responsibility requirements "consistent with the degree and duration of risk associated with the production, transportation, treatment, storage, or disposal of hazardous substances." Thus, the formula does not reflect a level of financial responsibility that EPA in its discretion believes is appropriate.

The financial responsibility formula proposed for hardrock mining was specific to that industry, and was not designed for use in future rulemakings under section 108(b). In future rulemakings under section 108(b), EPA will evaluate how to determine financial responsibility amounts for each particular rule, and will propose an appropriate methodology on which it would seek additional public comment.

C. Concerns Regarding Costs and Economic Impacts of the Proposed Rule

1. Overall Concerns Regarding Cost and Economic Impact

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EPA received significant comments on the Regulatory Impact Analysis (RIA) for the proposed section 108(b) rule that highlight detrimental economic outcomes of concern to commenters. In addition to numerous comments critical of various methodological and data limitations in the RIA, the leading criticism focuses on the disparity between projected industry costs in comparison with the rule's predicted transfer of liability costs from the government to the hardrock mining industry.

Using a period of analysis from 2021 to 2055, and assuming a seven percent social discount rate, EPA estimated the annualized compliance costs for industry to procure third-party instruments would be approximately $111 to $171 million (the net present value (NPV) of which is $1.4 to 2.2 billion over 34 years). These values represent the proposed rule's estimated incremental costs to industry.[319]

EPA then also quantified the transfer of potential CERCLA-related costs from the government to private industry that the proposed rule would yield. Based on an assumed facility default rate of 7.5 percent, the rule was expected to transfer a burden of just $15 to 15.5 million in annual liability from the federal government to the regulated industry (or $511 to $527 million over 34 years).

Based on these estimates, commenters objected that the projected annualized costs to industry ($111 – $171 million) are a magnitude of order higher than the avoided costs to the government ($15 – 15.5 million) sought by the rule. Estimates of government cost savings in the baseline, and industry compliance costs under the rule, occur under different regulatory scenarios and are therefore not readily comparable. However, these findings do reveal that the costs borne

[319] The majority of the industry costs represented a transfer from the regulated industry to the financial industry in association with the procurement of third party instruments, and hence the quantified annualized net social costs were estimated at $30 million to $44 million.

by industry far exceed the relative scale of cost savings gained by the government as a result of the rule. In the words of one owner/operator, "the proposed rules inflict grossly disproportionate burdens on the hardrock mining industry relative to the small benefit that it is intended to provide to the taxpayers."[320]

Beyond these concerns, commenters also took significant issue with the broader economic impacts that the rule could have on the hardrock mining industry and the nation. A trade association noted that the cost of compliance relative to cash flow will be devastating to many companies.[321] According to some, the high cost of compliance will result in existing mines closing, and new mines not being built. Another commenter stated that the high costs of the rule would force more companies into bankruptcy, which they suggested is an unacceptable environmental risk without any demonstrated benefits.[322] That commenter stated that it takes much effort and expertise over several years to administer a bankruptcy, so it is important to keep operators in business to conduct their own reclamation responsibilities. [323]

State mining associations also repeatedly commented on the importance of the hardrock mining sector in their individual states.[324] States commented that they would be grievously harmed financially if facilities reduced operations, ceased planned expansions, or otherwise closed or went bankrupt. In states where mining is prevalent, those states count heavily upon the tax and permitting revenues, jobs, etc. that come from the industry.

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[320] See comments from Freeport McMoran, EPA-HQ-SFUND-2015-0781-2793 page 3.
[321] EPA-HQ-SFUND-2015-0781-2666-20 / Organization: ACC, AFPM, AISI , CKRC, IMA-NA, NAM, NMA, NAMC, PCA, SSP, TFI, and the Chamber.
[322] See comment from Scott Richey and Susan Elliott, USDA Forest Service Humboldt-Toiyabee National Forest EPA-HQ-SFUND-2015-0781-2722 page 1.
[323] Ibid., page 1.
[324] See comment from Arizona Mining Association Docket ID: EPA-HQ-SFUND-2015-0781-2744 at pages 2-3.

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According to AEMA the cash collateral required to obtain a section 108(b) financial responsibility instrument could be significant and also very problematic, because this cash collateral requirement reduces the capital that companies have available to conduct reclamation activities, advance environmental improvement initiatives, and pursue development opportunities. Ultimately, AEMA commented that the drain on corporate capital from the section 108(b) financial responsibility program would reduce the domestic production of minerals, cost hardrock mining jobs, and economically devastate mining dependent rural communities.[325]

In an effort to further emphasize the adverse economic impacts of the proposed rule, an analysis was independently conducted by Dr. Gordon Rausser of OnPoint Analytics, on behalf of Freeport McMoRan, and submitted for the record in this rulemaking.[326] These industry supported analyses found that when all impacts are considered (including impacts on cash flow, production, and available resources), the proposed rule is estimated to cost the U.S. hardrock mining industry ten times the amount projected in the RIA – an amount reported to be between 23 percent and 66 percent of annual industry profits. The study also estimates that U.S. investment in the hardrock mining industry would drop by more than $5.6 billion, and that between 3,486 to 10,110 jobs would be lost in the U.S. hardrock mining industry should the proposed rule have become final.[327]

Lastly, commenters note that while mining occurs at the local level, the mining sector is a global industry. A commenter stated that increased costs have implications at the state and local levels, but these same increased costs could place U.S. mining at a competitive disadvantage.

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[325] See comment from American Exploration and Mining Association, Docket ID: EPA-HQ-SFUND-2015-0781-2657 page 35.
[326] EPA-HQ-SFUND-2015-0781-2650-4 / Organization: New Mexico Mining Association.
[327] EPA-HQ-SFUND-2015-0781-2712-135 / Organization: Newmont Mining Corporation.

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The commenter further explained that those increases could be a disincentive to investment in domestic projects and an incentive to focus on operations and production outside of the U.S.[328] The commenter continued to speculate that this could further result in a shortage of strategic metals at home. The commenter explained by way of an example that lithium is viewed as a strategic mineral currently in high demand globally as a lubricant, for use in steel and aluminum production, and in batteries and in electrolytes and electrodes.[329] Finally, the commenter stated that lithium mining is an area of considerable expansion in the U.S., and implied that could be threated under the proposed rule.[330]

EPA's decision not to issue final requirements under section 108(b) for hardrock mining facilities will thus alleviate potential burden on owners and operators, and will help prevent any disruptions to markets in the U.S. and abroad. EPA further seeks to avoid negatively impacting facility resources that could otherwise have greater benefits to the economy. The state of Idaho, for example, commented that the proposed requirements may divert funds from uses such as the implementation of environmental protection and enhancement programs, reclamation projects, exploration and development of new mineral deposits, etc.[331]

2. Concerns Particular to Impacts on Small Entities/Businesses

Concerns raised by commenters also point to the burden that the proposed rule could impose on small entities. In the RIA of the proposed rule, EPA assessed the economic impacts on small entities. Of the 221 mines and mineral processing facilities in the potentially regulated universe, EPA identified approximately 53 facilities that were owned by 44 small businesses. Twelve additional mines have owners of unknown size (due to lack of available company data).

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[328] See comment from Nevada Mining Association Docket ID: EPA-HQ-SFUND-2015-0781-2684 pg 11.
[329] Ibid.
[330] Ibid.
[331] See comment from State of Idaho Docket ID: EPA-HQ-SFUND-2015-0781-2682 at page 7.

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For these small entities, EPA compared the estimated annualized compliance costs with their annual revenues in order to assess whether these small entities could be expected to incur costs that constitute a significant impact; and whether the number of those small entities estimated to incur a significant impact represent a substantial number of small entities. Results of the analysis showed that 80 percent to 87 percent of these small entities may face an average annual compliance cost that is greater than one percent of their revenues. Similarly, 57 percent to 75 percent of these small entities may experience impacts upon revenues that exceed three percent. These impact estimates were found by EPA to surpass the significant impact thresholds as set forth by the Regulatory Flexibility Act.

In line with these findings, many of the commenters likewise suggested that a major number of small entities under the proposed rule would face significant annualized costs which would either severely hinder their ability to operate, cause them to cease operations, or be a barrier to them being able to acquire financing to begin new operations. In light of the findings from the Agency's own small entity analyses, and the comments of concern raised by the regulated community, EPA agrees that the proposed financial responsibility requirements could prove particularly burdensome for small businesses. Such impacts will be avoided in the absence of such requirements under this final decision.

D. Concerns Regarding Financial Responsibility Instrument Availability

As discussed above, during the public comment period for the section 108(b) hardrock mining rule, commenters representing or participating in the insurance, surety, and banking industries identified several concerns with EPA's proposed instrument terms, and expressed concern that those terms could impact the availability of instruments. Similarly, entities in the

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mining industry expressed concerns that instruments may not be available for the amounts proposed in the forms specified. EPA agrees with these concerns.

Section 108(b) discusses particular instruments for EPA to consider in its regulations. Specifically, paragraph (b)(2) states that financial responsibility may be established by any one, or any combination, of the following: insurance, guarantee, surety bond, letter of credit, or qualification as a self-insurer. Paragraph (b)(2) further authorizes the President to specify policy or other contractual terms, conditions, or defenses that are necessary, or that are unacceptable in establishing evidence of financial responsibility. Paragraph (b)(2) also requires EPA to cooperate with and seek the advice of the commercial insurance industry to the maximum extent practicable when developing financial responsibility requirements. Paragraph (b)(4) provides direction on how the section 108(b) instruments are to address multiple owners and operators at a single facility.

Section 108(c) also includes a "direct action" provision, under which CERCLA claims can be brought directly against an insurer or other entity issuing an instrument pursuant to the section 108(b) regulations. Section 108(c)(2) provides that any claim authorized by section 107 or section 111 may be asserted directly against any guarantor providing evidence of financial responsibility under section 108(b) if the person is liable under section 107 and: (1) is in bankruptcy, reorganization, or arrangement pursuant to the Federal Bankruptcy Code, or (2) is likely to be solvent at the time of judgment but over whom jurisdiction in the federal courts cannot be reached with reasonable diligence.

The areas of most significant concern identified by commenters are: (1) the specification that the instruments need pay to multiple claimants; (2) the direct action provisions in the

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instruments; and (3) the continuity of coverage provisions that subject providers to potential liability. These three features of the proposed section 108(b) financial responsibility program and the comments received regarding each are discussed below.

The specification that the instruments need pay to multiple claimants

EPA proposed that instruments would be payable to the full range of potential future CERCLA claimants, and not solely to a currently designated beneficiary specified in instruments.

Financial industry representatives commenting on the proposed rule expressed concerns that the proposed financial mechanisms would not have a single designated beneficiary. Commenters argued that instrument providers would be required to undertake more due diligence and exercise more discretion while also potentially being subject to more liability themselves absent a specified designated beneficiary.

Direct action provision

Commenters also expressed concern that providers of instruments may be subject to direct action suit. However, the CERCLA statute itself, at section 108(c)(2), includes a direct action provision that expressly authorizes, in specified circumstances, any claim under section 107 and section 111 be made directly against the guarantor providing evidence of financial responsibility. Commenters from the surety industry claimed that the direct action provision significantly increased their risk exposure and included too broad of a trigger (bankruptcy). Banking industry representatives asserted that the provision was at odds with relevant commercial law and practice and would significantly deter banks from providing such instruments and services. The insurance industry commented that direct action creates the

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potential for significant increase in defense costs and administrative costs associated with the management of multiple lawsuits.

Continuity of coverage provisions

To address the risk that the facility would no longer have financial responsibility when necessary, EPA proposed that owners and operators using a letter of credit, surety bond or insurance to demonstrate financial responsibility also establish a standby trust. In the event the instrument issuer intended to cancel the instrument and the owner or operator failed to obtain alternate financial responsibility, EPA could draw on the instrument and fund the standby trust.

Commenters from the surety and insurance industry suggested that the requirements for prescriptive cancellation provisions that include potential issuer liability would limit the interest on behalf of sureties and insurers in providing mechanisms. Commenters also suggested that this proposed provision in combination with the difficult-to-predict date at which a facility may be released from the proposed financial responsibility requirements created unwelcome uncertainty around the duration of the provider's obligation.

Based on the negative comments received, EPA believes there is uncertainty around the adequate availability of instruments were final regulations to be promulgated at this time. This uncertainty necessarily means it is also unclear whether regulated entities would be able to obtain the necessary instruments when faced with a regulatory obligation under section 108(b) to obtain an instrument. This information thus also indicates that issuance of section 108(b) requirements for current hardrock mining operations is not appropriate.

E. Challenges to Identify the Facility

Many commenters on the rule raised concerns regarding the applicability of section 108(b) to historical mining areas at facilities. The question of what the relevant facility is for

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purposes of section 108(b) regulations arose in several contexts – developing requirements for applicability of the rule, determining a financial responsibility amount, and developing conditions for payment of funds from the instruments. This was another difficult challenge EPA encountered in developing the proposed rule.

In a typical CERCLA response action, the definition of the facility relies on a site-by-site determination based on site-specific conditions, and the facility is defined by where contamination comes to be located, as understood by EPA at a particular point in time, and is typically formally delineated in a decision document identifying the response actions to be taken. The relevant facility may include areas owned and/or operated by several parties and the facility is defined without regard to ownership. In addition, particular parties' CERCLA liability is determined through settlements and/or litigation.

For the reasons discussed in the proposed rule, for purposes of determining the proposed rule's applicability, and for determining the financial responsibility amount, EPA found it necessary to consider the relevant facility to be only the current operations of the current owner(s) and operator(s). Two effects of this approach were to not require a financial responsibility amount under the proposed rule based on conditions present at historic areas of the mine, or to require evidence of financial responsibility from parties other than the current owner(s) or operator(s).

This approach – that EPA found necessary to implement section 108(b) – has no effect on CERCLA liability for parties that may be involved at a CERCLA site, or on the definition of facility for purposes of a CERCLA response. Thus, in the context of a particular response action, the facility may be defined to include an area broader than the current operations, and CERCLA liability may attach to parties other than the current owner or operator. Thus, there is

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an inconsistency in these respects between what EPA believed was necessary for practical development of section 108(b) instruments, and the definition that would apply when the instruments are invoked.

This difficulty was also identified by outside parties to EPA. Instrument providers, during pre-proposal outreach, cited the inability to distinguish between and establish separate amounts for historic releases and potential future releases as a factor that may increase the cost and difficulty of obtaining instruments. Specifically, representatives of insurance companies noted that combining two distinct types of coverage (e.g. coverage for cleanup of known existing releases and coverage for liabilities that may arise from future releases) will increase premiums. Another insurance representative commented that amounts of coverage may be limited by reinsurance treaties if the two types of coverage were combined.[332] Relatedly, a representative from a surety also noted that separating out known pre-existing issues and releases from current operations that have not yet occurred into separate mechanisms would likely enhance availability.[333] Yet it was the impossibility of predetermining the source of any contamination that would ultimately be the subject of a CERCLA claim, or where contamination would ultimately come to be located, that was a factor in EPA's decision to propose instruments that could pay for any CERCLA section 107 or section 111 claims against a current owner or operator, irrespective of whether the claim arose as a result of current or historical operations.

Commenters' concerns also highlight another source of uncertainty for instrument availability. Thus, this issue raises similar concerns as in section E. Above. Therefore, this

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[332] See Notes and Attendees for CERCLA 108(b) Insurance Meeting December 8, 2015 Docket ID: EPA-HQ-SFUND-2015-0781-0447.

[333] See Notes and Attendees for CERCLA 108(b) Surety Meeting January 14, 2016 Docket ID: EPA-HQ-SFUND-2015-0781-0445.

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information further supports EPA's determination that issuance of section 108(b) requirements for current hardrock mining operations is not appropriate.

VII. Statutory and Executive Order Reviews[334]

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

This action is a significant regulatory action that was submitted to the Office of Management and Budget (OMB) for review, because it may raise novel legal or policy issues [3(f)(4)], although it is not economically significant. Any changes made in response to OMB recommendations have been documented in the docket. EPA prepared an economic analysis for the proposed rule, but that analysis is not relevant for this final rule because no regulatory provisions are being finalized.

B. Executive Order 13771: Reducing Regulation and Controlling Regulatory Costs

This action is not an Executive Order 13771 regulatory or deregulatory action, because this action does not alter any regulatory requirements.

C. Paperwork Reduction Act (PRA)

This action does not impose an information collection burden under the PRA, because this action does not impose any regulatory requirements.

D. Regulatory Flexibility Act (RFA)

I certify that this action will not have a significant economic impact on a substantial number of small entities under the RFA. This action will not impose any requirements on small entities.

E. Unfunded Mandates Reform Act (UMRA)

[334] Additional information about these statutes and Executive Orders can be found at https://www.epa.gov/laws-regulations/laws-and-executive-orders.

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This action does not contain any unfunded mandate as described in UMRA, 2 U.S.C. 1531-1538, and does not significantly or uniquely affect small governments, because this action does not impose any regulatory requirements.

F. Executive Order 13132: Federalism

This action does not have federalism implications. It will not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government.

G. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action does not have tribal implications as specified in Executive Order 13175, because this action imposes no regulatory requirements. Thus, Executive Order 13175 does not apply to this action. However, EPA consulted with tribes and Alaska Native Corporations and Alaska Native Villages during the rulemaking process.

EPA received comments from three federally-recognized tribes and from three Alaska Native Claims Settlement Act (ANCSA) resource managers regarding section 108(b) financial responsibility. Tribal comments were generally in support of the proposed rule, and cited some concerns about the potential negative impacts of hardrock mining on commercial enterprises and on subsistence living, along with the need to more fully identify the benefits of the rule. A primary ANCSA concern was that the section 108(b) financial responsibility requirements would duplicate existing federal and state requirements, resulting in a negative impact on Alaska Natives and states, that receive royalties through the Regional and Village Corporations. Other ANCSA comments related primarily to the calculation of the financial responsibility amount, and requested that EPA consult with them early in the regulatory development process. EPA acknowledged the challenges in determining a financial responsibility amount, and provided the

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opportunity for federally-recognized tribes and ANCSA resource managers to consult with the Agency during the public comment period.

H. Executive Order 13045: Protection of Children from Environmental Health and Safety Risks

This action is not subject to Executive Order 13045 because it is not economically significant as defined in Executive Order 12866, and because EPA does not believe the environmental health or safety risks addressed by this action present a disproportionate risk to children, since this action imposes no regulatory requirements.

I. Executive Order 13211: Actions that Significantly Affect Energy Supply, Distribution, or Use

This action is not a "significant energy action" because it is not likely to have a significant adverse effect on the supply, distribution or use of energy.

J. National Technology Transfer and Advancement Act

This rulemaking does not involve technical standards.

K. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations

EPA believes that this action is not subject to Executive Order 12898 (59 FR 7629, February 16, 1994) because it does not establish an environmental health or safety standard, since this action imposes no regulatory requirements.

L. Congressional Review Act (CRA)

This action is subject to the CRA, and EPA will submit a rule report to each House of the Congress and to the Comptroller General of the United States. This action is not a "major rule" as defined by 5 U.S.C. 804(2).

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List of Subjects

40 CFR Part 320

Environmental protection, Financial responsibility, Hardrock mining, Hazardous substances.

Dated: DEC 01 2017

E. Scott Pruitt,
Administrator.

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To: reisenberg@nam.org[reisenberg@nam.org]; rjones@nam.org[rjones@nam.org]
From: Jackson, Ryan
Sent: Sun 4/23/2017 7:57:26 PM
Subject: Presidential Memo on Domestic Manufacturing
FINAL EPA Response to Commerce 4-21-2017 with appendix.pdf

I wanted you to have EPA's contributions to implement the Memo.

Ryan Jackson

Chief of Staff

U.S. Environmental Protection Agency

Ex. 6 - Personal Privacy

United States Environmental Protection Agency

Response to Department of Commerce Questions on Permit Streamlining and Reducing Regulatory Burdens for Domestic Manufacturing

April 21, 2017

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Introduction

On January 24, 2017, President Trump signed the Presidential Memorandum on Streamlining Permitting and Reducing Regulatory Burdens for Domestic Manufacturing. The stated purpose of the memorandum was to "support the expansion of manufacturing in the United States through expedited reviews of and approvals for proposals to construct or expand manufacturing facilities and through reductions in regulatory burdens affecting domestic manufacturing." The Environmental Protection Agency (EPA), which is tasked with the mission of protecting human health and the environment, is equally committed to engaging in robust regulatory reforms to reduce unnecessary burdens on domestic manufacturing consistent with the President's directive.

There are over 250,000 manufacturers in the US with more than 11.4 million employees, making manufacturing the fourth largest industry providing domestic jobs.[1] Nearly six in 10 U.S. export dollars come from manufacturing.[2] Despite manufacturer's positive economic impact, environmental regulations have resulted in manufacturers spending nearly twice the amount on regulatory compliance than is spent by the average U.S. business.[3] For small manufacturers, the amount spent on regulatory compliance is about triple that of the average U.S. business.[4] According to the National Association of Manufacturers, federal environmental regulations impose nearly 75,000 air, water, and waste-related restrictions on U.S. manufacturers.[5] Mining projects typically lose one-third of their value due to permit approval delays.[6] The World Bank ranks the US 39th in the world with regard to the ease for businesses in dealing with construction permits.[7] Accordingly, review of EPA's permitting processes is timely.

EPA implements a host of environmental statutes that affect domestic manufacturing. Certain permitting requirements impose direct costs (e.g. time and resources to prepare the permit application), costs associated with uncertainty and delay (e.g. financial costs and potential penalties), and opportunity costs of delay and cancellation (e.g. forgone production and emissions reductions).[8] Delays in the approval of permits by federal or State permitting authorities can also postpone or prevent manufacturers from building, expanding or beginning operations, even if the affected operations may be deemed suitable as proposed. The costs associated with environmental permitting are not well documented, yet the "hidden cost of environmental regulation" are acute for manufacturers, including the facilities that are never built, projects foregone, and jobs that are not created. Given the extraordinary potential of the U.S. manufacturing sector to contribute to the growth of the national economy and assist in the restoration of the nation's infrastructure, EPA is committed to comprehensive regulatory reform and streamlining of its permitting and other processes.

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[1] https://www.census.gov/library/visualizations/2016/comm/manufacturing_day2016.html; http://www.nam.org/Newsroom/Top-20-Facts-About-Manufacturing/

[2] https://www.census.gov/library/visualizations/2016/comm/manufacturing_day2016.html

[3] Paul Noe. *Smarter Regulation for the American Manufacturing Economy*. 2016. https://spea.indiana.edu/doc/mpp/noe-reg.pdf

[4] Paul Noe. *Smarter Regulation for the American Manufacturing Economy*. 2016. https://spea.indiana.edu/doc/mpp/noe-reg.pdf

[5] Pareto Policy Solutions, LLC. Report to the National Association of Manufacturers.*Holding US Back: Regulation of the U.S. Manufacturing Sector*. 2017. http://www.nam.org/Data-and-Reports/Reports/NAM-Belton-Regulatory-Study/

[6] http://mineralsmakelife.org/assets/images/content/resources/SNL_Permitting_Delay_Report-Online.pdf

[7] http://www.doingbusiness.org/rankings

[8] Arthur Fraas et. al., EPA's New Source Review Program: Time for reform? (47 ELR 10026, 10030)

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Executive Summary

Pursuant to the Presidential Memorandum, the Department of Commerce (DOC) asked participating departments and agencies to provide a report on its statutory, regulatory and permitting requirements that may affect domestic manufacturing; to describe any ongoing or potential efforts to improve these processes; and to identify any specific regulatory reform targets that may reduce burdens on manufacturers. This paper serves as the Environmental Protection Agency (EPA) response to DOC's request. The paper is organized as follows:

- Section I provides a high-level summary of relevant EPA statutes, regulatory requirements and permitting programs, including estimates of the regulated universe by statute and by program, and a summary of delegated and authorized states by regulatory or permitting program.
- Section II summarizes the EPA's to streamline its permitting processes and identifies several opportunities in which EPA's various regulatory programs and associated permitting processes might be further simplified.
- Appendix A includes background documents summarizing EPA's past efforts to quantify time taken for permit issuance.
- Appendix B includes process maps addressing relevant EPA statutes, associated regulatory programs and permitting processes.

Through the potential streamlining efforts described herein, EPA believes the Agency can create greater environmental results in the long-term and achieve the following goals:

- Speed manufacturers' "time-to-market" for new and improved products/facilities;
- Reduce the burden on manufacturer resources responding to the permitting process;
- Reduce the frequency and severity of unintended permit violations; and
- Increase clarity surrounding permitting requirements.

EPA is taking regulatory reform very seriously, and under Administrator Pruitt's leadership, it has been proactive in soliciting input from a broad range of stakeholders that will inform plans over the next few months by the Agency's Regulatory Reform Task Force in response to several Executive Orders. The regulatory programs that affect domestic manufacturers also affect other industrial sectors, and the Task Force is looking to synthesize information from multiple sources, including the DOC's Request for Information (RFI), comments in EPA's regulatory reform docket, input from public meetings, and recommendations from EPA programmatic offices to inform its regulatory reform work over the next few months. EPA believes through these efforts, the Agency can maintain environmental protections and meaningfully improve its permitting and regulatory programs to reduce burdens on domestic manufacturers, consistent with the President's directives.

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I. Summary of Pertinent EPA Statutes and Regulatory/Permitting Programs Potentially Affecting Domestic Manufacturing

EPA implements several major environmental statutes through regulatory or permitting programs that may affect domestic manufacturers. In some cases, the permitting program is mandated directly by statute, and in other cases, the permitting program is the result of regulations promulgated by EPA in response to a statute. A summary of these statutes and programs are summarized in **Table 1.**

Table 1.

Summary of Pertinent EPA Statutes, Regulatory Requirements, and Permitting Programs
AIR
Clean Air Act
New Source Review (NSR), National Ambient Air Quality Standards (NAAQS) In areas that attain NAAQS, NSR permits are referred to as Prevention of Significant Deterioration or "PSD" permits. In NAAQS nonattainment areas, they are referred to as Nonattainment NSR or "NNSR" permits.
☐ PSD Pre-construction for new major sources, major modifications of existing sources of criteria pollutants.
☐ Minor NSR construction permits.
☐ Major Construction Nonattainment NSR Permit for new major sources or major modifications to major sources in a nonattainment area.
Title V Operating Permits / Petitions
☐ *Title V (Part 70) sets forth operating permits issued by state/local/tribal air permitting authorities; Title V (Part 71) sets for the federal air quality operating permit program where EPA issues permits to a limited number of sources [e.g. Indian Country; outer continental shelf (beyond the State's seaward boundaries); EPA's objection to a state issued Part 70 operating permit and the state does not fully respond to EPA's objections; and, a state's Part 70 operating permit program that is expired or withdrawn].*
WATER
Safe Drinking Water Act
SDWA Underground Injection Control (UIC) Program. Injection of all materials underground must be authorized either under general rules or specific permits. There are six well classes with varied regulatory or permitting requirements. Note: In 1984 banned the use of Class IV injection wells (hazardous or radioactive waste).
☐ Permits for Class I industrial and municipal waste injection, including deep well injection of hazardous fluids below the lowermost underground source of drinking water (USDW).
☐ Permits for Class II Enhanced Oil Recovery wells.
☐ Permits for Class III uranium in-situ recovery (ISR) wells.
☐ Registration of Class V wells injecting non-hazardous fluids into/above USDW.

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Summary of Pertinent EPA Statutes, Regulatory Requirements, and Permitting Programs
☐ Permits for Class VI Geologic Sequestration of Carbon Dioxide (CO2).
Clean Water Act (CWA)
CWA Section 402, National Pollutant Discharge Elimination System (N). Discharge of wastewater or storm water from a point source (e.g. pipe, ditch, channel) into a surface water of the U.S. (e.g. lake, river and/or ocean).
☐ "Major" NPDES permits for existing sources with major modifications, including, but not limited to, a new outfall, a new or changed process resulting in the discharge of new pollutants, or an increase in production resulting in an increased discharge of pollutants.
☐ "Non-Major" industrial NPDES permits that are identified by EPA on a national or regional basis as a focus area, for new sources or new dischargers.
☐ Pretreatment Permits to dispose of pretreated wastewaters and sanitary sewage in Publicly Owned Treatment Works (POTWs).
☐ Individual permits for facilities discharging pollutants of concern at a level of significance to impaired water bodies that have 60+ points on the major/minor NPDES permit rating worksheet.
CWA Section 404, NPDES. Dredge and Fill Wetlands Permits, wherein the U.S. Army Corps of Engineers has authority to issue permits, but the EPA develops the environmental criteria for permit application; determines the geographic jurisdiction and applicability of exemptions under the program; and comments on draft permits.
☐ New construction of manufacturing plants or plant expansions (including parking lots or rainwater collection lakes, water bodies) that will affect "waters of the United States" (WOTUS).
LAND
Resource Conservation and Recovery Act (RCRA)
RCRA, Subtitle C – Hazardous Waste Discharges. Owners/operators of facilities that treat, store or dispose of hazardous materials must have a permit to govern their operations.
☐ New permits for operation, closure, post-closure activities.
☐ Modifications to existing permits that address new treatment processes.
☐ Corrective action cleanups involving possible off-site impacts.
RCRA, Subtitle D – Criteria for Municipal Solid Waste Landfills. Minimum criteria established for owners/operators of municipal solid waste landfill (MSWLF) units.
☐ New permits for location, design, construction, operation, closure and/or post-closure of MSWLFs.
☐ Modifications to existing permits.
Toxic Substances Control Act (TSCA)
TSCA Polychlorinated-biphenyls (PCB).
☐ PCB waste disposal activities in commercial landfills where there will be potential releases of PCBs and/or dioxins to the air, water and ground exceeding the regulatory levels from its operations
☐ Approvals for PCB commercial storage.
☐ Disposal facility and risk-based cleanup approvals for permits that may involve activities with significant public health or environmental impacts.
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
☐ All pesticides distributed or sold in the US must be registered by EPA.

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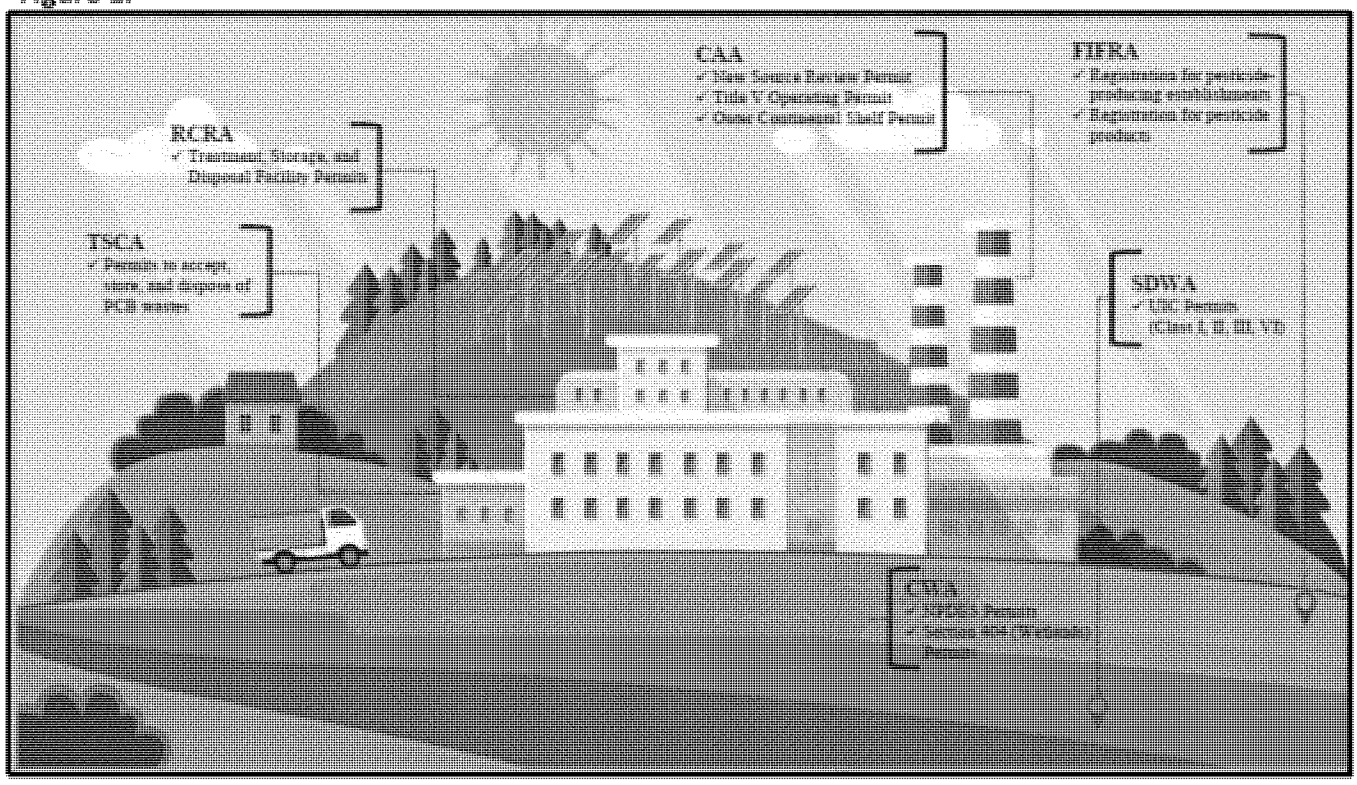
These regulatory and permitting programs span all types of entities across all types of media and boundaries. Manufacturers that engage in industrial or commercial activities impacting a combination of air, land, and water may need to obtain a variety of permits to satisfy multiple environmental statutes across a variety of regulatory regimes and geographic areas.[9] As illustrated in **Figure 1**, a single facility or "unit" may be subject to different EPA permitting programs. For example, some EPA programs require an **individual permit** for a single facility while other EPA permitting regimes require a separate permit for each potential pollution source or operating unit along the manufacturing chain. Under either scenario, a single manufacturer may, depending on its activities, be required to apply for and maintain multiple environmental permits to satisfy several statutory and regulatory regimes.

Figure 1.



In addition to unit-specific permits, EPA may issue a "**general permit**" that governs a common geographic area or certain categories. For example, EPA issues over 80,000 general permits a year for construction. EPA has also issued a total 500,000 general permits for vessels, pesticide applications, and different types of stormwater. Accordingly, a general permit can cover a multitude of pollution sources and/or companies. In order for a company's activities to be covered under a general permit, it is required to file a "Notice of Intent" rather than apply for an individual permit. **Figure 2** provides an overview of the number of regulated and permitted facilities by statute based on EPA's Enforcement and Compliance History Online (ECHO), a web application that tracks facility-level compliance with multiple federal statutes and EPA regulatory requirements.[10]

[9]To address the potentially burdensome nature of obtaining myriad permits, the EPA has issued exemptions for classes of companies operating in various industry sectors.
[10] Available online at https://echo.epa.gov.

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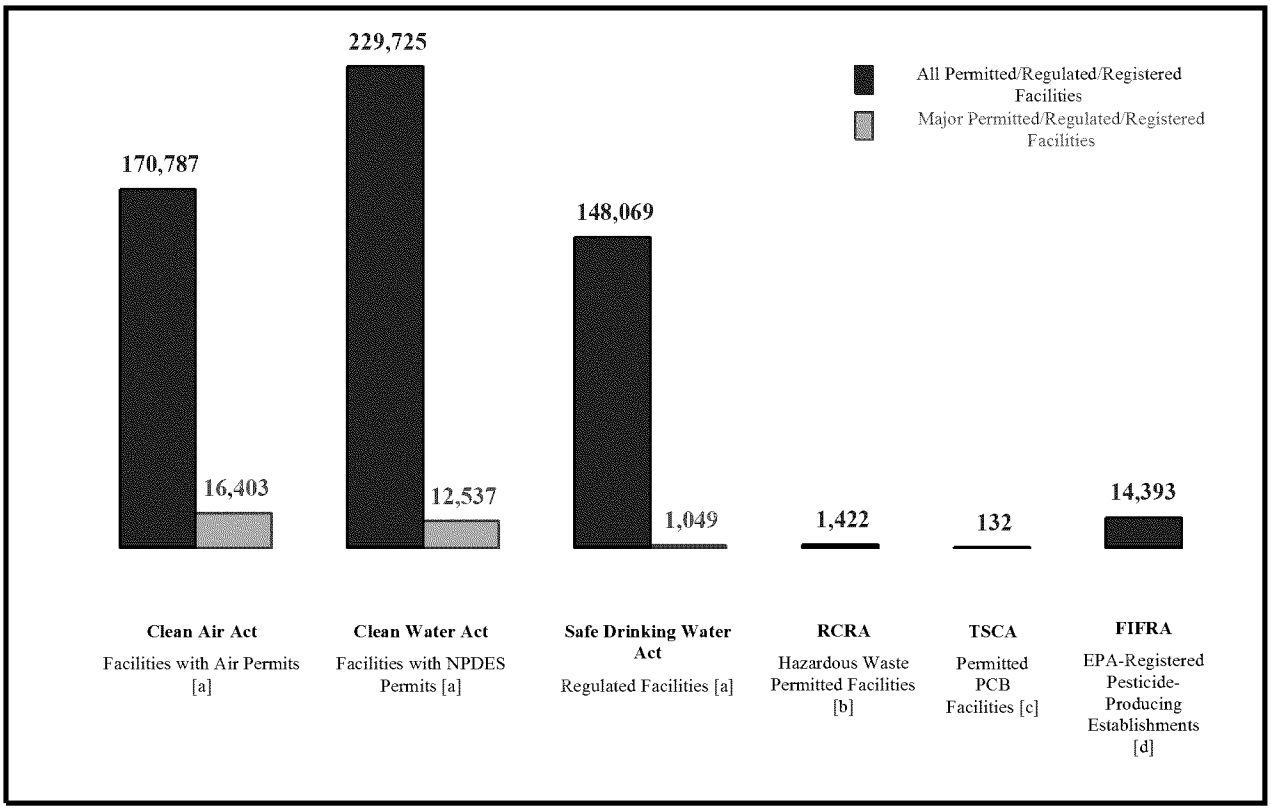
Figure 2.



Sources: [a]EPA, ECHO Web Application, Facility Search; [b]EPA, Biennial Hazardous Waste Report, 2015 Reporting Cycle; [c]EPA, Disposal and Storage of Polychlorinated Biphenyl (PCB) Waste webpage; [d]EPA, ECHO Web Application, Pesticide Dashboard, National Pesticide Establishment Dashboard View; "Major" generally indicates a "large" facility or establishment. What constitutes large (or major) varies by statute by rule.

Responsibility for implementing these complex permitting programs does not rest solely on the EPA; it may be authorized or delegated to a state or tribal government under certain statutes. In order for EPA to authorize or delegate authority, a state or tribal government must demonstrate its program is equivalent to or more stringent than the federal program in a written agreement with EPA. An authorized or delegated state or tribal nation accepts primary responsibility for implementing the specific environmental program while EPA maintains a critical oversight role of the state or tribal authorized or delegated program. EPA also retains the authority to monitor compliance and enforcement activities in authorized or delegated states or tribal nations. **Figure 3** illustrates EPA-authorized, EPA-delegated, or EPA-approved state programs by statute.

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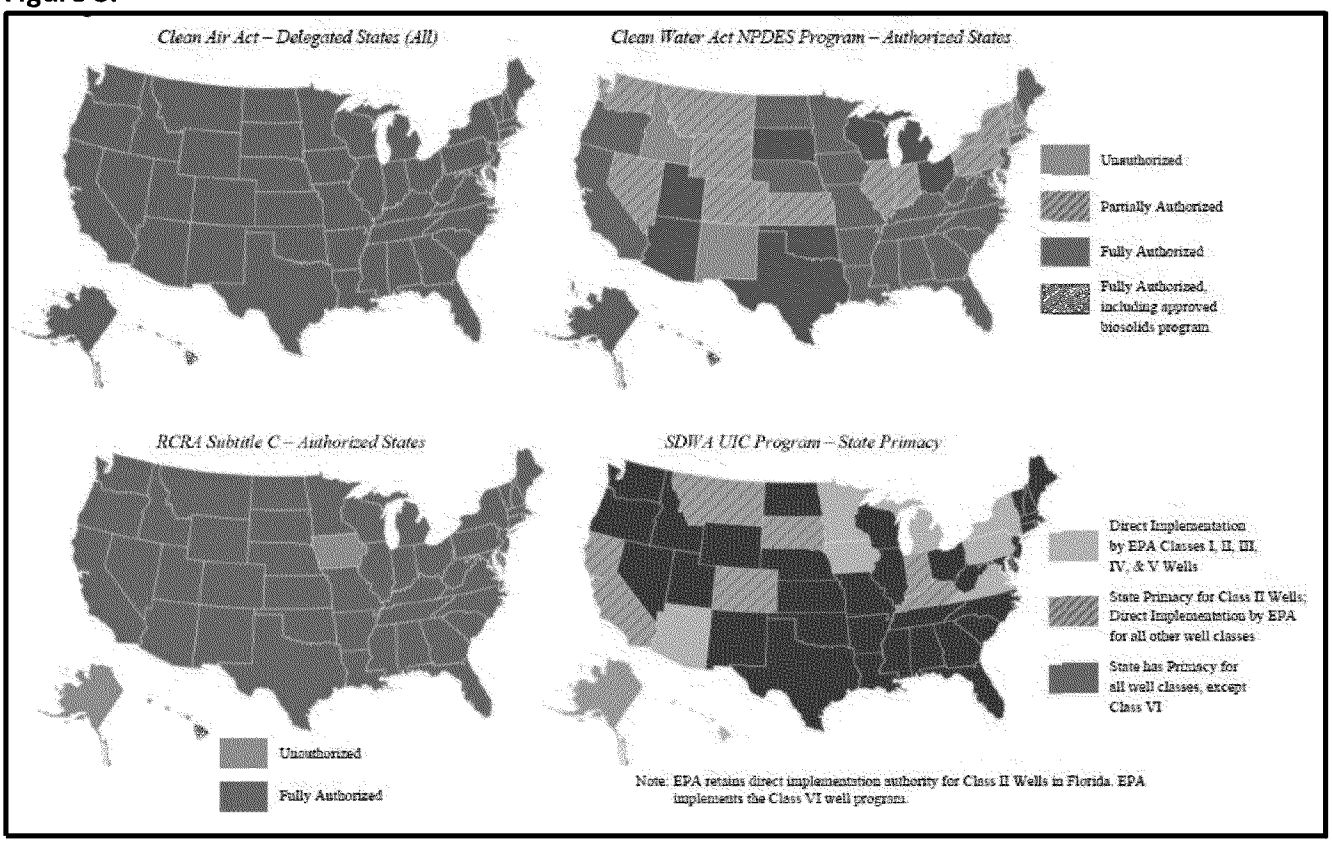
Figure 3.



The following subsection provides a more detailed summary of relevant EPA statutes, regulatory requirements and permitting programs, including estimates of the regulated universe by statute and program.

I.A Clean Air Act

A majority of EPA's regulatory and permitting programs stem from the Clean Air Act (CAA), which was enacted by Congress in 1970 and subsequently amended in 1977 and 1990. Key permitting programs under the CAA include: the new source review permit program, the Title V operating permit program, as well as a number of other permit programs that apply to specific sources under specific circumstances.

New Source Review (NSR) Permit Program.[11] Under the NSR program, sources seeking to build a new facility, or undertake a major modification (e.g., a change that significantly increases emissions as defined in applicable regulations), must apply for and obtain a permit to ensure that the area in which the source is located will continue to attain or maintain the national ambient air quality standards (NAAQS). Facilities must comply with permit requirements, which may include: 1) what construction is allowed; 2) what air emissions limits must be met; and, 3) how the facility or pollution source can be operated. To ensure compliance with emissions limits, permits also contain monitoring, record-keeping, and reporting requirements. Minor NSR permits cover pollutants from stationary sources that do not require a prevention of significant deterioration (PSD) or non-

[11] The New Source Review Permit Program is authorized by U.S. Code, Title 42, Chapter 85, Subchapter I, Parts C and D, as well as Section 110(a)(2)(C) of Part A.

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attainment NSR (NNSR) permits (i.e., emissions at levels below defined major source emission thresholds). States are able to customize the requirements of the minor NSR program as long as their program meets minimum requirements. Since the purpose of the NSR program is to attain compliance with the NAAQS, EPA may approve state, local, or tribal authorization to issue a NSR permit through a State Implementation Plan (SIP) revision.

Title V, Operating Permit Program.[12] The Title V program was established with the 1990 CAA Amendments. Operating permits apply to large industrial and commercial facilities and pollution sources. The operating permit essentially incorporates all applicable CAA requirements for the source, and ensures that there is adequate monitoring, recordkeeping, and reporting to assure compliance with these requirements. Sources with operating permits are required by the CAA to certify compliance with applicable permit requirements at least annually, and the permits themselves must be renewed every five years. These permits describe: 1) which pollutants are being released; 2) how much of each pollutant may be released; and, 3) what measures or steps are required to reduce pollution.

EPA may authorize Title V operating permitting authority to a state, local, or tribal government. In these cases, the authorized state, local, or tribal government has the primary responsibility for running permitting programs in their jurisdictions, including reviewing permit applications and issuing permits. In certain geographies, such as some U.S. territories, or states where no corresponding permitting program is implemented, EPA has the role of issuing permits.

Outer Continental Shelf (OCS) Air Permits. The CAA also includes a number of other permit programs that apply to specific sources under certain circumstances. For instance, the OCS Air permits establish the applicable air pollution control requirements, including provisions related to permitting, monitoring, reporting, fees, compliance, and enforcement, for facilities subject to the CAA section 328 and 40 CFR Part 55. These regulations apply to OCS Sources that are located beyond state seaward boundaries. Applicants located beyond 25 nautical miles from the state seaward boundary are subject to federal air quality requirements and will likely need an OCS permit to comply with the EPA's PSD preconstruction permit program, and/or Part 71 of the Title V operating permit program, among other federal requirements.

The OCS regulations are generally implemented and enforced by the EPA Regional Offices, but may be delegated to an adjacent or corresponding state or local air permitting agency. OCS sources are typically involved in oil and gas exploration, development, or production or offshore wind farm installation, and do not include Deepwater Ports involved in liquefied natural gas (LNG) import and export.

- As of April 12, 2017, ECHO indicates **170,787 active and operating facilities with air permits under the CAA**. This includes, **16,403 "major" facilities.**[13] As previously noted, "Major" generally indicates a "large" facility or establishment; what constitutes large (or major) varies by statute, by rule.

[12] Title V of the Clean Air Act is codified as U.S. Code, Title 42, Chapter 85, Subchapter V, Sections 7661 to 7661f. The Code of Federal Regulations, Title 40, Chapter I, Subchapter C, Parts 70 and 71 detail the requirements of the Operating Permit Program.
[13] See EPA's ECHO web application, Facility Search Feature, criteria: 1) Active/Operating; 2) Must Have Air Permit; and, 3) Major. https://echo.epa.gov/facilities/facility-search?srch=adv.

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I.B. Clean Water Act

In 1972, Congress enacted the Clean Water Act (CWA), which amended the 1948 Federal Water Pollution Control Act.[14] There are two key permit programs under the CWA: the National Pollutant Discharge Elimination System and the Section 404 Permit Program.

National Pollutant Discharge Elimination System (NPDES). NPDES governs pollutant discharges from a "point source" into navigable waters.[15] Industrial, municipal, and other facilities must obtain permits if they discharge pollutants directly to surface waters. NPDES permits specify an acceptable level of a pollutant in a discharge and contain limits on discharges to water, monitoring and reporting requirements, and other provisions to ensure that discharges do not harm water quality of human health. They may also require compliance with certain generic best management practices, such as installing a screen over a pipe to prevent debris from entering a waterway. In so doing, NPDES permits ensure that mandatory standards for clean water are met. NPDES permits may not be issued for a term longer than five years; permittees that wish to continue discharging beyond a five-year term must submit an application for permit renewal. NPDES permits come in two forms: "individual" and "general" permits. NPDES individual permits reflect site-specific conditions of a single discharger, and are unique to that discharger. NPDES general permits are written to cover multiple dischargers with similar operations and types of discharges.

- As of April 12, 2017, ECHO indicates **229,725 facilities active and operating facilities with a NPDES permit**. This includes **12,537 "major" facilities**.[16]

Section 404 Permit Program. EPA also plays an essential role in the Section 404 Permit Program, which regulates the discharge of dredged or fill material into waters, including wetlands, as required under Section 404 of the CWA.[17] Except for certain farming and forestry activities, all development, infrastructure, and mining projects must receive a 404 permit before they can discharge dredged or fill material into water. The U.S. Army Corps of Engineers administers the 404 program on a day-to-day basis and enforces permit provisions, but EPA develops the environmental criteria to be used for the permit application, and determines the geographic jurisdiction and applicability of exemptions for the program.

When an entity applies for a Section 404 Permit, it must demonstrate that steps have been taken to avoid impacts to wetlands, streams, and other aquatic resources, that potential impacts from discharges have been minimized, and that compensation will be provided for all remaining unavoidable impacts. Similar to NPDES permits, general Section 404 permits can be issued on a nationwide, regional, or state basis for particular categories of activities, which eliminates the need

[14] U.S. Code, Title 33, Chapter 26.

[15] EPA's regulations to implement and administer the NPDES permit program are located in the Code of Federal Regulations, Title 40, Part 122.

[16] See EPA's ECHO web application, Facility Search Feature, criteria: 1) Active/Operating; 2) Must Have Water Permit (ICIS-NPDES); and, 3) Major. https://echo.epa.gov/facilities/facility-search?srch=adv

[17] U.S. Code, Title 33, Chapter 26, Subchapter IV, Section 1344; https://www.epa.gov/cwa-404/c LEAN -water-act-section-404. EPA guidelines are established by EPA in the Code of Federal Regulations, Title 40, Part 230.

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for individual review and allows activities to proceed with little or no delay, if the general permit's conditions are met.

I.C. Safe Drinking Water Act

Congress passed the Safe Drinking Water Act (SDWA) in 1974 to protect public health by preserving the quality of the nation's public drinking water supply.[18] The Act authorizes EPA to set national standards for drinking water quality, and then to act in concert with states and local water systems to ensure that these standards are met by taking actions to protect rivers, lakes, reservoirs, springs, and ground water wells. The key permitting regime under the SDWA is the Underground Injection Control Program.

Underground Injection Control (UIC) Program.[19] Among other requirements, the SDWA required EPA to develop minimum federal requirements for practices at injection wells to prevent contamination of underground sources of drinking water, which EPA does through its promulgation of the UIC Program. Under this program, all injection must be authorized under either general rules or specific permits. Because there are different classes of injection wells, the permit requirements differ.

Class I wells are those used to inject hazardous and non-hazardous waste into deep, confined rock formations; the permits for Class I wells address aspects of their siting, construction, operation, monitoring and testing, reporting and recordkeeping, and closure. Class II wells are used to inject fluids, primarily brines, associated with oil and natural gas production; Class II wells used for disposal purposes must be permitted, with the permits indicating construction, testing, and inspection requirements. Class III wells, which inject fluids used to dissolve and extract minerals, must be operated under individual or area-based permits, with construction, operation, testing, monitoring, and closure requirements. In 1984, EPA banned the use of Class IV injection wells. These wells may only operate as part of an EPA- or state-authorized ground water cleanup action. Class V wells are used to inject non-hazardous fluids underground. Most Class V wells are used to dispose of wastes into or above underground sources of drinking water. Class VI wells are used to inject carbon dioxide into deep rock formations and feature similar permit requirements, along with additional, tailored requirements that address the unique nature of injecting carbon dioxide.

Similar to programs promulgated under the CAA and CWA, states and tribes can acquire the primary responsibility to implement the UIC Program within their borders. In areas where a state or tribe has not applied for, or not been granted the ability to administer and implement the Program by EPA, EPA is responsible for Program implementation through one of its Regional offices.

- As of April 12, 2017, ECHO indicates **148,069 facilities with a registered identification number under the Safe Drinking Water Act.** This includes **1,049 "major" facilities.**[20]

[18] U.S. Code, Title 42, Chapter 6A, Subchapter 12.
[19] Code of Federal Regulations, Title 40, Parts 144 through 148.
[20] See EPA's ECHO web application, Facility Search Feature, criteria: 1) Active/Operating; 2) Must Have SDWA ID; and, 3) Major. https://echo.epa.gov/facilities/facility-search?srch=adv.

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EPA also maintains a National UIC Inventory, which is updated annually.[21]

- The latest available National UIC Inventory (Federal Fiscal Year 2015) indicates a total of **62,381 permitted wells**, including Class I wells, Class II disposal wells, Class III wells, and Class VI wells.[22] In total, this inventory identifies: 140 Class I Hazardous Wells; 682 Class I Other Wells; 38,864 Class II Disposal Wells; 144,991 Class II Recovery Wells; 505 Class II Other Wells; 96 Class III sites; 22,688 Class III Wells; 29 Class IV Sites; 20 Class IV Wells; 476,898 Class V Wells; and, 7 Class VI Wells.

I.D. Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) was passed by Congress in 1976.[23] The Act describes a national waste management framework mandated by Congress and gives EPA authority to develop a waste management program through regulations providing explicit, legally enforceable requirements.[24]

The requirements of RCRA, as implemented by EPA, institute a national system of solid waste control. Hazardous waste is regulated under Subtitle C of the Act; EPA has developed a comprehensive, cradle-to-grave **Subtitle C program** that ensures hazardous waste is managed safely from the moment it is generated through its final disposal. Specific regulations under this program establish criteria and regulatory requirements, including **permitting**, for hazardous waste generators and transporters, as well as facilities that treat, store, and dispose of hazardous waste.

Specifically, owners or operators of facilities where hazardous waste is treated, stored, or disposed must have a permit which governs the operational, closure, and post-closure standards of the facility. While facilities that generate hazardous waste are not required to obtain a Subtitle C permit governing their activities, they must still apply for an EPA Identification Number (EPA ID) and provide notification of their hazardous waste generation activities to the regulator. Note that some small hazardous waste generators are exempt from these requirements at the federal level, though state-specific requirements may still apply.

EPA employs a variety of data sources to track hazardous waste activities, including generation, transport, and management. EPA's RCRAInfoWeb application provides a detailed listing of all facilities generating, managing, shipping, and receiving hazardous waste through each hazardous waste biennial reporting cycle.[25]

- The latest available Biennial Report data (2015) indicate a total of **1,422 facilities managing and/or receiving hazardous waste.** This consists of 1,292 facilities reporting managing at least 0.1 tons of hazardous waste, 419 facilities reporting receiving at least 0.1 tons of hazardous

[21] See https://www.epa.gov/sites/production/files/2016-10/documents/underground_injection_control_inventory_fy_2015_0.pdf.
[22] To the extent that other well types, such as Class II non-disposal wells, may also be permitted on a geography-specific basis, this figure may be an underestimate.
[23] U.S. Code, Title 42, Chapter 82.
[24] The regulatory requirements for the waste management program under the Resource Conserv ation and Recovery Act are located in the Code of Federal Regulations, Title 40, Chapter I, Parts 239 through 282.
[25] See EPA's Biennial Report Summary application at https://rcrainfo.epa.gov/rcrainfoweb/action/modules/br/national/view.

waste, and 289 facilities receiving both managing and receiving at least 0.1 tons of hazardous waste.[26]

Like other statutes, under Subtitle C of RCRA, EPA may authorize states to implement certain key provisions of the hazardous waste program in lieu of the Federal government. Where a state program to do so does not exist, or where such authorization has not been granted, EPA directly implements the Subtitle C hazardous waste management program.

While hazardous waste is regulated under Subtitle C, RCRA also includes requirements for a non-hazardous waste program under **Subtitle D**, to be implemented by states. EPA established a number of provisions and regulatory requirements under Subtitle D for non-hazardous waste, including the banning of open dumping of waste, and the establishment of criteria for the operation of municipal waste and industrial waste landfills. States play a lead role in implementing Subtitle D regulations, and may set more stringent requirements than those established by EPA.

Congress amended RCRA in 1984 through the Hazardous and Solid Waste Amendments to the Solid Waste Disposal Act.[27] These Amendments added Subtitle I to RCRA, creating a federal program to regulate **underground storage tanks (USTs)**.[28] Subtitle I has been amended multiple times since, including through the Superfund Amendments Reauthorization Act in 1986, which authorized EPA to respond to petroleum leaks and spills and directed EPA to establish financial responsibility requirements for UST owners and operators. Faulty installation or inadequate operating and maintenance procedures can cause USTs, which mainly store petroleum, to release their hazardous contents into the environment. Accordingly, EPA regulations prevent health and environmental risks from soil and groundwater contamination through the establishment and maintenance of technical standards for operation and maintenance of USTs.

I.E. Toxic Substances Control Act

The Toxic Substances Control Act of 1976 (TSCA) provides EPA with the authority to require reporting, recordkeeping and testing requirements, and restrictions relating to chemical substances and/or mixtures.[29] Specifically, the Act addresses the production, important, use, and disposal of specific chemicals, including polychlorinated biphenyls (PCBs), asbestos, radon, and lead-based paint.

One EPA focus under the TSCA is the **regulation of PCBs**, which are no longer commercially produced in the United States. However, because previously-produced PCBs can still be released into the environment, EPA regulates activities involving these hazardous substances.[30] Companies or persons

[26] Estimated through use of the raw dataset underlying the 2015 Biennial Report, accessible at https://rcrainfo.epa.gov/rcrainfoweb/action/modules/br/national?__fp=TkHYkyKBockBCh7M23dwbKUMq0qZYlyJSf-hu--9ZdyLr0rVOo9IblTa5cFs-3KhW9RpVFDJ-xvgM8nLOkGcHQ%3D%3D&d-4711493-e=2&searchCriteria.stateCode=ALL&search=Submit&searchCriteria.reportCycle=2015&6578706f7274=1&__sourcePage=bFHwrn6Vxz4UVqRHxxRfYn5dIoeSO33NCgWtginWANj_bzrB38Aiuw%3D%3D. Specifically, filtering on Column E, "Managed (Tons)" for non-zero values indicates 1,292 facilities; filtering on Column G, "Received (Tons") indicates 419 facilities. Combining Columns E and G and filtering for remaining non-zero values indicates 1,422 facilities.

[27] U.S. Statutes, Title 98, Chapter 3224; Public Law 98-616, November 8, 1984.

[28] EPA's regulatory requirements for USTs are codified in the Code of Federal Regulations, Title 40, Chapter I, Subchapter I, Parts 280 and 281.

[29] U.S. Code Title 15, Chapter 53, Subchapter I.

[30] EPA's PCB regulations can be found within the Code of Federal Regulations, Title 40, Chapter I, Subchapter R, Part 761.

transporting or disposing of PCBs must notify EPA and receive an EPA ID. These requirements also apply to entities conducting PCB research and development. In addition, EPA issues approvals for facilities to accept, store, and/or dispose of PCB waste on a facility-by-facility basis. EPA also issues approvals for certain types of PCB decontamination processes. EPA maintains lists of the facilities approved to accept, store, and dispose of PCB waste, as well as conduct other PCB activities.

- As of April 12, 2017, EPA data indicate that **58 facilities** have been issued disposal approvals by EPA under TSCA to accept and/or dispose of PCB waste. An additional **67 facilities** have been issued permits to store PCBs under proper disposal of these wastes can occur. **Seven facilities** have also been issued special EPA approvals for specific PCB decontamination processes.[31]

Under Section 5 of TSCA EPA has established an inventory of chemical substances. If a chemical is not already on the inventory, and has not been excluded by TSCA, a premanufacture notice (PMN) must be submitted to EPA prior to manufacture or import. The PMN must identify the chemical and provide available information on health and environmental effects. If available data are not sufficient to evaluate the chemical's effects, EPA can impose restrictions pending the development of information on its health and environmental effects. EPA can also restrict significant new uses of chemicals based upon factors such as the projected volume and use of the chemical.

I.F. Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1996 provides for federal regulation of pesticide distribution, sale, and use.[32] Under the Act, all pesticides distributed or sold in the United States must be registered (licensed) by EPA; only those pesticides whose use will not result in unreasonable risks to human health or the environment, or result in dietary risks, can be registered.

EPA's Office of Pesticide Programs holds primary responsibility for conducting the **Pesticide Registration Process** under the Act. In so doing, it evaluates scientific data and assesses the risks and benefits of a pesticide's use, designs label directions to control product use, requires training and certifications for applicators of restricted use pesticides and workers in pesticide-treated areas, and suspends or cancels pesticide registrations as necessary.[33]

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[31] See EPA, "List of PCB Disposal Facilities and Approvals by Technology Type and EPA Region," at https://www.epa.gov/pcbs/list-polychlorinated-biphenyl-pcb-disposal-facilities-and-approvals-technology-type-and-epa for the list of EPA-issued PCB disposal approvals. See EPA, "List of Approved PCB Commercial Storage Facilities by EPA Region," at https://www.epa.gov/pcbs/list-approved-polychlorinated-biphenyl-pcb-commercial-storage-facilities-epa-region for the list of EPA-issued PCB storage permits. See EPA, "Facilities that Have Obtained Approval for Specific Decontamination Processes," at https://www.epa.gov/pcbs/disposal-and-storage-polychlorinated-biphenyl-pcb-waste#PCBactivities, for the list of facilities with special EPA approvals for specific PCB decontamination processes.

[32] U.S. Code, Title 7, Chapter 6, Subchapter II.

[33] EPA regulations implementing pesticide-related statutes, including the Federal Insecticide, Fungicide, and Rodenticide Act, but also other statutes relating to pesticides, are available in the Code of Federal Regulations, Title 40, Chapter I, Subchapter E, Parts 150 to 189.

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Section 7 of FIFRA also requires that production of pesticides, including formulation, packaging, repackaging, labeling, and relabeling, be conducted in a registered establishment. EPA maintains the Section 7 Tracking System.

- As of April 12, 2017, ECHO indicates **11,884 domestically-owned and registered pesticide-producing establishments**. ECHO further indicates **2,509 foreign-owned, registered pesticide-producing establishments**. These establishments include pesticide manufacturers, pesticide sellers, and pesticide distributors.

Unlike other statutes, which require permits or registrations for individual pollutant sources or for facilities, EPA's responsibilities under the FIFRA also pertain to the registration of individual pesticide *products*. Many publicly accessible databases provide inventories of pesticide products.

- As of April 12, 2017, the National Pesticide Information Center lists **408,203 federally-registered pesticide products**.[34]

II. Opportunities to Simplify EPA's Regulatory Programs and Associated Permitting Processes

As evidenced from Section I, EPA employs complex regulatory and permitting programs. EPA is committed to engaging in robust streamlining of its permitting regimes and reducing regulatory burdens for domestic manufacturers. While the agency has already made some improvements to its permitting processes, there are significant opportunities for reforms. Identifying and implementing those reforms will require collaboration with EPA's state and tribal partners and consultation with affected entities. Each effort will require its own set of performance metrics and outcome measures (e.g., reduced time, paperwork, duplication) in order to reduce costs and improve programmatic efficiency. Through these streamlining efforts, EPA believes the agency can create greater environmental results in the long-term and achieve the following goals:

- Speed manufacturers' "time-to-market" for new and improved products/facilities;
- Reduce the burden on manufacturer resources responding to the permitting process;
- Reduce the frequency and severity of unintended permit violations; and
- Increase clarity surrounding permitting requirements.

EPA views the permitting process as an opportunity for continuous improvement. Its Headquarters Program Offices and its Regional Offices have begun engaging in recent years in a number of business process improvement efforts. The success of these limited efforts highlight a significant opportunity to intensify and scale up EPA's overall efforts to realize even greater benefits. A few of these efforts are described below.

[34] See the National Pesticide Information Center's "Product Research Online" database at http://npic.orst.edu/NPRO/.

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II. A. Continuous Improvement Efforts to Streamline Permitting Processes and Minimize Regulatory Burden

A cornerstone of EPA's improvement efforts to streamline permitting processes includes the E-Enterprise for the Environment ePermitting and eReporting strategy. **E-Enterprise for the Environment** is a new model EPA is undertaking to bolster collaborative leadership among environmental co-regulators. Through this strategy, EPA is working with the states and tribes to simplify, streamline and modernize the implementation of the Agency's environmental permitting and reporting programs. The tools and technology available to co-regulators are enhanced by mobile applications, online portals, smart tools and other investments in information technology. Streamlining processes and using smarter tools produces improved efficiency making co-regulators more productive. In turn, these productivity benefits also help regulated entities, such as those in the manufacturing sector, by reducing the time it takes to report and manage compliance.

In addition to E-Enterprise, EPA has launched several specific continuous improvement efforts depicted in **Table 2** and further described below that are tailored by media, statute, and regulatory program.

Table 2

Ongoing and Proposed EPA Actions to Streamline Regulatory and Permitting Processes
AIR – CAA (Title V, NSR)
☐ **Triage State Implementation Plans (SIPs):** EPA is engaged with its regional offices to reduce process steps to cut the time required to review and approve SIPs. A SIP is a state-specific federally-enforceable plan that identifies how a state will attain and/or maintain NAAQS. EPA has a backlog of nearly 700 SIPs dating back to 2013. Through an EPA LEAN event, EPA Region 7 created a SIP review process that reduces the number of steps from 165 to 134 and the number of decisions from 14 to 8. In Region 10, the SIP review process is now split in three tracks (fast, normal and high involvement), which has reduced the average process time from 19 months to 12.
☐ **EPA plans to continue its process towards finalizing the Title V Petitions Rulemaking:** EPA issued a proposed rule on August 24, 2016 (81 FR 57822), revising its regulations to streamline and clarify processes related to the submission and review of Title V petitions that could be submitted by a petitioner to challenge a proposed Title V permit.
☐ **Guidance on Ozone & $PM_{2.5}$ Significant Impact Levels (SILs):** EPA is in the process of crafting guidance to facilitate air quality assessments involving SILs as a compliance demonstration tool. SILs that can be used as alternatives to, or in conjunction with air quality modeling, and this guidance can streamline the modeling required in the permitting process.
☐ **Technical Guidance on Model Emissions Rates for Precursors of Ozone and Secondary $PM_{2.5}$:** EPA issued draft guidance to assist state and local air agencies and manufacturing permit applicants in conducting streamlined screenings for PSD compliance with Ozone and Secondary $PM_{2.5}$ NAAQS that reduces the burden of PSD compliance demonstrations.

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☐	**Data Management Tool for Permitted Emissions Limits & Controls:** EPA maintains a "clearinghouse" documenting permit decisions, specifically related to NSR. The tool also includes information on standards such as reasonably available control technology (RACT), best available control technology (BACT), and lowest achievable emission rates (LAER). This resource can assist permit applicants by diminishing uncertainty and increasing transparency, which can advance facility's ability to comply with permits.
WATER – SDWA, CWA (SEC 402 [NPDES], SEC 404)	
☐	**NPDES Applications and Program Updates Rule**: EPA is engaged in revisions to modernize NPDES regulatory requirements consistent with CWA amendments and recent case law. Specifically, EPA's proposed revisions would eliminate regulatory inconsistencies, improve permit documentation, enhance permit transparency, and eliminate outdated provisions.
☐	**Streamline NPDES Permit Application Forms**: EPA is considering streamlining the permit application process for all industrial sectors, including those required of new manufacturing facilities. Consistent with this effort, EPA is exploring options to modernize the application process, providing an online "fill-and-print" version of the forms.
☐	**NPDES Technical Assistance to Affected Manufacturing Facilities**: EPA is proposing to provide technical assistance to affected companies through a suite of information technology tools. The objective of these tools is to help the regulated universe quickly and efficiently identify which forms must be completed, and available resources to help in completing the forms.
☐	**Initiate a LEAN process for NPDES applications**: EPA is considering undertaking a LEAN initiative with the goal of eliminating inefficiencies in the permitting process, and minimizing duplication of effort. As part of this effort, EPA proposes to focus on developing training modules that focus on best practices for new permit applications to ensure that their NPDES application is complete and accurate, thereby avoiding unnecessary delays.
LAND – RCRA SUBTITLE C, TSCA	
☐	**RCRA Streamlined Permit Renewal Process:** RCRA permits must be renewed every 5-10 years. Reviewing applications and approving permits can be a lengthy process— and if the process is unclear or has too many steps it creates backlogs that can potentially slow facility operations and take too much industry and government staff time to address. EPA partnered with the State of Massachusetts to conduct a LEAN event to streamline the RCRA permit renewal process. The new process simplifies and accelerates approvals. The time to develop a draft permit for renewal was more than halved: reducing the burden on facility operators and allowing them to invest staff time in other critical tasks.
☐	**RCRA Facilities Investigation Remedy Selection Track (RCRA FIRST):** Investigating facilities' RCRA contamination and selecting an approach to cleanup can take, on average, 16 years. Working with States and other stakeholders through a LEAN process, EPA is looking to reduce this time significantly, in some cases by more than 50 percent. EPA has started to use the RCRA FIRST to accelerate cleanup of contaminated sites and getting these sites ready for community redevelopment. RCRA FIRST is designed to save taxpayer dollars, reduce risks to human health and the environment, and expedite economic development.
☐	**PCB Facility Approval Streamlining Toolbox (PCB FAST**): By working with stakeholders, EPA has learned about key issues that results in undue delays in PCB site cleanups. This can "mothball" properties for years – leaving them vacant and unavailable to communities for

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economic redevelopment. Through one regional office (in San Francisco), EPA engaged partners in LEAN business process improvement exercises to reduce the time to approve PCB cleanup applications by 20 percent through. The outcome of PCB FAST is a streamlined, standardized template for the application that is transferrable across EPA's ten regions.

II.A.1. AIR – Clean Air Act (NSR, NAAQS, PSD)

- ***State Implementation Plans (SIP)***– A SIP is a state-specific, federally-enforceable plan that identifies how a state will attain and/or maintain the primary and secondary National Ambient Air Quality Standards (NAAQS) under the Clean Air Act (CAA). The EPA is required to review and approve SIPs for each state and, as of 2013, had a backlog of nearly 700 SIPs waiting to be reviewed. As of September 30, 2016, EPA significantly reduced that backlog, but still had a backlog of 322 SIPs.

  Notably, EPA Regions 7 and 10 made significant improvements to the SIP review process that drastically cut the time required to review and approve SIPs. Through EPA's LEAN government methods for identifying and eliminating waste, since 2013, EPA has reduced the backlog of SIPs waiting to be reviewed and approved by roughly 80%. Specifically, Region 7 is reducing its SIP review process steps from 165 to 134 and the numbers of decisions from 14 to 8; Region 10 is splitting its old process into three tracks (i.e. fast, normal, and high involvement), with a 36% average reduction in process time from 19 to 12 months. Along with their state partners, they eliminated steps, created standard procedures, clarified roles and responsibilities, and made many other improvements. Going forward, these improvements will allow EPA to more quickly review and approve plans, which will provide more certainty to states and local industries and better environmental protection for communities.

  EPA is preparing to share these new strategies and tools Agency-wide and with states to use to eliminate steps and clarify expectations for SIP review process in the next month or so. The expedited review process provides early guidance to states on non-attainment area designations and boundaries, developing a road map for each geographic area that outlines how stakeholders can collaborate. These developed tools will: create a schedule for the SIP development and review process for all parties; triage SIPs based on difficulty of review; shift from sequential to concurrent steps at as many points as possible in the process; and engage regional planning organizations for technical work on multi-state issues.

- ***Title V Petitions Rulemaking*** – EPA issued a proposed rule on August 24, 2016, (see 81 FR 57822) to revise its regulations to streamline and clarify processes related to submission and review of Title V petitions. The petition process rulemaking will allowEPA to take advantage of new technology and improve transparency for our stakeholders, and to support E-enterprise, an EPA-state initiative to improve environmental performance and enhance services to the regulated community, environmental agencies, and the public.

  The proposal covered five key areas, each of which should increase stakeholder access to and understanding of the petition process and aid the EPA's review of petitions. First, EPA proposed regulatory provisions that provide direction as to how petitions should be

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submitted to the Agency. Second, EPA proposed regulatory provisions that describe the expected format and minimum required content for Title V petitions. Third, the proposal clarified that permitting authorities are required to respond to significant comments received during the public comment period for draft Title V permits, and to provide that response with the proposed Title V permit to EPA for the Agency's 45-day review period. Fourth, the guidance was in the form of "recommended practices" for various stakeholders to help ensure Title V permits have complete administrative records and comport with the requirements of the CAA. Fifth, this notice presented information on the Agency's interpretation of certain Title V provisions of the CAA and its implementing regulations regarding the steps following an EPA objection in response to a Title V petition. The public comment period closed on October 24, 2016. EPA plans to continue the process towards finalizing this rule.

- ***Guidance on Ozone and $PM_{2.5}$ Significant Impact Levels (SILs)*** – The CAA requires that a proposed source subject to PSD permitting demonstrate that its impacts will not cause or contribute to a violation of NAAQS or PSD increments. Significant Impact Levels (SILs) are compliance demonstration tools that can be used in air quality assessments, either as alternatives to or in conjunction with air quality modeling. This draft guidance provides these tools for ozone and particulate matter ($PM_{2.5}$) and a comprehensive basis for using them in making the required PSD air quality impact demonstration. Use of SILs as compliance demonstration tools can protect air quality but also streamline the air quality modeling in the permitting process for PSD sources. The guidance preserves the discretion of permitting authorities to use or not use SILs in their programs. The draft guidance is being revised according to comments received during the informal public comment period and technical peer review. EPA plans to continue the process towards finalizing this guidance.

- ***Technical Guidance on Developing and Use of Model Emissions Rates for Precursors (MERPs) for Ozone and Secondary $PM_{2.5}$*** – EPA issued this draft guidance to assist state/local air agencies and manufacturing permit applicants in conducting screening level PSD compliance demonstrations for ozone and secondary $PM_{2.5}$. This guidance streamlines the permit process by providing a framework for a suitable screening approach for ozone and $PM_{2.5}$ along with EPA modeling data for use in conducting the assessment for PSD. The guidance streamlines and reduces burden of PSD compliance demonstrations for ozone and secondary $PM_{2.5}$ by providing a specific screening technique based on EPA modeling that is scientifically credible and flexible for use by permit applicants. EPA received positive public comments on this screening technique in both its proposed rulemaking to revise *Guideline on Air Quality Models* and the draft guidance document. EPA plans to continue the process towards finalizing this guidance.

- ***Database of Permitted Emission Limits and Controls*** – The EPA has maintained a "clearinghouse" documenting permit decisions, specifically focused on NSR permits, and certain standards such as reasonably available control technology (RACT), best available control technology (BACT), and lowest achievable emission (LAER) . Over the past several years, the EPA has improved the electronic platform and content contained within the RACT/BACT/LAER clearinghouse. Opportunities remain to improve both the platform and the content in a manner that would better serve as a permitting support tool for not only the

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regulated community, but also state/local permitting authorities. The EPA could engage in outreach with key stakeholders and identify aspects of this database that could be improved to support more streamlined and expedited New Source Review permitting.

- ***Outreach and Communication on Flexible Air Permitting Options*** – We intend to highlight and encourage use of flexible air permitting options by developing a comprehensive website and providing communication, outreach, and training to industry and permitting authorities on this issue. This would apply to both operating and preconstruction permits. This project would educate the regulated community as well as permitting authorities about the existing streamlined, but possibly underused, permitting options. These options are particularly useful to dynamic manufacturing sectors such as the semiconductor industry and other "quick-to-market" businesses that may have changes in product lines and other changes that can impact emissions. This effort would also dovetail with other efforts seeking to improve the economic competitiveness of the U.S. manufacturing sector.

II.A.2. WATER – SDWA, CWA (SEC 402, SEC 404), NPDES

- ***NPDES Applications and Program Updates Rule*** – EPA is proposing revisions that would modernize the National Pollutant Discharge Elimination System regulations. The revisions would eliminate regulatory and application form inconsistencies; improve permit documentation, transparency and oversight; clarify existing regulations; and remove outdated provisions. The proposed revisions would provide NPDES permit writers with improved tools to write well-documented permits to protect human health and the environment. The revisions would also provide the public with enhanced opportunities for public participation in permitting actions. These revisions would further align NPDES regulations with statutory requirements from the 1987 CWA Amendments and more recent case law requirements. Potential benefits include reducing regulatory burdens, costs, and uncertainty and increasing transparency, which can advance facility's ability to comply with permits, advancing environmental improvements, increasing production, and enhancing license to operate.

II.A.3 LAND – RCRA Subtitle C, TSCA

- ***RCRA Streamlined Permit Renewal Process*** – EPA Region 1 and the Massachusetts Department of Environmental Protection conducted an EPA LEAN event to streamline the RCRA permit renewal process. The new process simplifies and accelerates approvals by front-loading and standardizing communications with each permittee to ensure all parties understand expectations prior to submitting the application. As a result, the number of process steps were reduced from 31 to 24, while the time required to develop a draft permit was reduced from 15 to 6.5 months. The new process includes the following key strategies and tools: meeting face to face with the permittee before initiating the renewal process; using standard communications to establish expectations and a timeline upfront; dividing sections of the permit among a team; developing a tracking sheet to keep a schedule to complete the permit in 6.5 months; and using or adapting tools from the RCRA Permitting Toolbox to improve outcomes. EPA is making these tools available Agency-wide to simplify and accelerate approvals of RCRA permits.

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- ***RCRA Facilities Investigation Remedy Selection Track (RCRA FIRST)*** – Before contaminated industrial sites can be cleaned up and redeveloped, EPA must complete the feasibility investigation and remedy selection process, which the RCRA FIRST approach through business process improvement is making far more efficient to save taxpayer dollars, reduce risks sooner, and expedite economic development.[35] EPA held two LEAN business process improvement events in which regional, headquarters, state, and industry representatives mapped and analyzed existing process steps. The two key root causes of delays in the old processes included: 1) no common understanding by all stakeholders upfront on site cleanup objectives; and 2) lack of an effective means to elevate and resolve cleanup issues. EPA then developed a new approach to the entire process, which when implemented will: reduce the planning and investigation phase by an estimated 49%, (i.e. 10 years to 5.1 years), and reduce the remedy selection phase by an estimated 75% (i.e. 6 years to between 1-2 years).

- ***PCB Facility Approval Streamlining Toolbox (PCB FAST)*** – EPA Region 9 reduced the time to approve PCB cleanup applications by 20% through an EPA LEAN business process improvement event. The improvements establish a standard template for the applications that can be used by other regions. Other best practices identified include reaching agreement upfront on the project plan before the application is submitted; completing the site characterization before submitting an application; and incorporating routine communication early and often lead to reduced time for the review. These changes will result in improving the quality of the application, reducing delays, and strengthening relationships with state partners and the regulated industry. A description of the LEAN event and all of the tools and lessons learned is being made available Agency-wide for others to simplify and accelerate the PCB cleanup approvals.

II. B. Potential Improvement Efforts to Streamline Permitting Processes and Minimize Regulatory Burden for Domestic Manufacturers

While the improvements described above are significant, the EPA acknowledges there are numerous opportunities for further reforms. Consistent with the Trump Administration's presidential memoranda and executive orders, EPA is committed to identifying additional opportunities to improve and streamline its permit processes and regulatory programs that impact the manufacturing sector. Potential new initiatives tailored by media, by statute follow. EPA expects to continue to review public comments received through its regulatory reform efforts and assess appropriate next steps for additional opportunities that may reduce burdens on domestic manufacturers.

II.B.1. AIR – Clean Air Act

- **Support to State and Local Air Permitting Authorities on Flexible Air Permits** - In addition to the ongoing efforts described above, the EPA could more directly engage with state and local

[35] https://www.epa.gov/sites/production/files/2016-06/documents/a_toolbox_for_corrective_action_resource_conservation_and_recovery_act_facilities_investigation_remedy_selection_track_rcra_first.pdf

air permitting authorities to support issuance of flexible air permits. The EPA could do this by offering support in permit reviews, supporting conversations between applicants and permitting authorities, and working collaboratively with state and local air permitting authorities.

II.B.2. WATER – Clean Water Act

Under the NPDES Program, there are several streamlining opportunities that, assuming resources are available, could be undertaken to achieve efficiencies.

- EPA could streamline EPA's NPDES permit application forms for all industrial sectors, including forms required of new manufacturing facilities. This is separate from the Applications and Program Updates Rule mentioned above. EPA's Office of Water could work with stakeholders to revise its NPDES permit applications and provide modernized, online "fill-and-print" versions of the forms to streamline use by new and expanding industrial dischargers. This cleanup and streamlining effort potentially could be done without revisions to existing application regulations.

  For background, new or expanding industrial and manufacturing facilities that discharge to waters of the United States, and which seek coverage under an "individual" NPDES permit, generally must submit detailed permit application forms to their federal or state permitting authority. The minimum contents of these application forms are established in federal regulations at 40 CFR 122.21. To support permit applicants, EPA developed a series of individual application forms for the various categories of applicants. While authorized state programs may develop their own application forms, many states utilize some or all of EPA's application forms.

  The current EPA application forms were developed and revised at various times over the past 30 years, and EPA has noted that there are inconsistencies in the structure, appearance, and detail of instructions accompanying these forms. Both applicants and state agencies have suggested that EPA should comprehensively revise the forms to provide a consistent look and feel, as well as consistent and enhanced detail in the instructions that accompany the forms. Over the past several years, EPA has begun to address these concerns and has developed initial drafts of all of its application forms. Potential benefits include reducing paperwork burden, which can decrease time spent by facilities to complete applications, waste, uncertainty, and potential for late submittals, as well as increase the overall accuracy in data collection and aggregation that will also improve ability for facilities to benchmark their environmental performance to their peers.

- EPA's Office of Water is proposing to provide technical assistance in a variety of forms to new manufacturing facilities for NPDES training and information technology tools. First, EPA could provide enhanced web resources to guide new manufacturing facility applicants through the NPDES permit application process. EPA could do this by developing an internet-based "wizard" to help new manufacturing facilities determine which forms are required to be filled out and to steer them in the direction of available resources to help them complete their permit applications. Potential benefits include reducing time spent by facilities to identify

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correct forms to be completed and by simplifying instructions for doing so, which can provide them with more time to advance environmental improvements (potentially improving compliance rates), enhance their license to operate, increase production, and respond to customer requests.

Second, EPA could provide dedicated training to new industrial facilities to reduce delays associated with incomplete or incorrectly filled out NPDES permit applications. Ensuring that the information coming is complete and accurate is a LEAN way to reduce rework. EPA could develop a dedicated training module focusing on suggested best practices for new permit applicants to ensure that their NPDES application is complete and accurate and to avoid unnecessary delays related to incorrect filings. Potential benefits include reducing time spent, waste, and cost incurred by facilities in completing permit applications, which can provide them more time to spend on value added efforts, including advancing environmental improvements, increasing production, and responding to customer requests.

II.C. EPA Actions Regarding Specific Regulatory Reform Targets

EPA is committed to fulfilling the President's memorandum on permit streamlining and regulatory burden reduction for domestic manufacturers. There are actions, which EPA can take under its existing authority (without regulatory or statutory change) to streamline permitting and permit reviews. Specifically, EPA is focused on replicating and expanding prior successful LEAN business process improvement efforts and taking new actions based on the outcomes of such efforts, subject to budgetary and administration priorities.

Providing regulatory reform targets for EPA's permitting programs or regulations is neither simple nor straightforward. As previously discussed, the EPA is bound by the provisions of multiple statutes and myriad promulgated regulations supporting these statutory provisions. EPA has already taken steps to respond to several recent Executive Orders issued by the Trump Administration, including:

Executive Order 13771 (82 FR 9339, February 3, 2017) on Reducing Regulation and Controlling Regulatory Costs directs federal agencies to modify or repeal two existing regulations for each new regulation proposed or finalized in fiscal year (FY) 2017 and thereafter. Subsequent Office of Management and Budget (OMB) guidance established that costs for final, significant rules in FY17 need to be fully offset by cost savings from modification or repeal of other regulations. For FY2018 and beyond, the director of OMB will provide agencies with a total amount of incremental costs that will be allowed.

Executive Order 13777 (82 FR 12285, March 1, 2017) on Enforcing the Regulatory Reform Agenda directs federal agencies to designate a Regulatory Reform Officer and to establish a Regulatory Reform Task Force (Task Force). One of the duties of the Task Force is to evaluate existing regulations and make recommendations to the agency head regarding regulations that may be appropriate for repeal, replacement, or modification. The Task Force is also required to submit a progress report in mid-May, 2017.

Executive Order 13778 (82 FR 12497, March 3, 2017) on Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the "Waters of the United States" Rule directs EPA to review all orders, rules, regulations, guidelines, and policies implementing or enforcing the final "Waters of the United States" Rule. Formal rulemaking procedures will follow to rescind or revise any parts of the rule.

Executive Order 13783 (82 FR 16093, March 31, 2017) on Promoting Energy Independence and Economic Growth directs the EPA to review the Clean Power Plan, related rules, and New Source Performance Standards for Oil and Gas. The EO also directs agencies to review existing regulations, orders, guidance documents, and policies that potentially burden the development or use of domestically produced energy resources. Heads of agencies are required to submit a plan for the review of existing regulations to OMB by mid-May, 2017, followed by a draft report detailing actions taken under the EO by late July 2017 and a final report due in late September 2017.

EPA has taken several actions to respond to these directives. In response to EO 13777, Administrator Pruitt sent an agency-wide memorandum that announced EPA's Regulatory Task Force and designated Samantha Dravis, Senior Counsel to the Administrator and Associate Administrator for Policy, as EPA's Regulatory Reform Officer. The Administrator's memorandum also requested multiple EPA offices to solicit input from the public on regulations that could be considered for repeal, replacement, or modification. On April 13, 2017, EPA published a *Federal Register* notice that opened a public docket for a 30-day comment period to facilitate receipt of that input. In addition, EPA offices are holding multiple meetings and teleconferences over the next three weeks to hear ideas and suggestions for regulatory reform directly from the public. Information about those meetings is available on EPA's newly launched Regulatory Reform website (https://www.epa.gov/laws-regulations/regulatory-reform). The information gathered at the public meetings and teleconferences, as well as the public comments provided in response to EPA's solicitation and the Department of Commerce Request for Information (RFI) will inform the progress report required by EO 13777 that the Regulatory Reform Task Force will submit to the EPA Administrator by May 26, 2017.

In response to EOs 13778 and 13783, the EPA has already announced plans to review the Clean Water Rule, the Clean Power Plan, and related actions. In further response to EO 13783, the EPA Administrator has asked the Regulatory Reform Task Force to lead the Agency's efforts to review existing regulations that might burden the development or use of domestically produced energy resources. EPA program offices that are conducting public outreach in response to EO 13777 have been asked to look for input regarding such regulations and identify them to the Task Force. Under EO 13783, EPA has to submit a plan to the OMB Director by May 12, 2017, that proposes a plan to carry out the Agency's review of burdensome regulations on domestically produced energy. A draft report with specific recommendations is then due in late July.

EPA is taking regulatory reform very seriously, and has been proactive in soliciting input in a variety of venues that will inform multiple plans and reports that will be developed over the next few months by the Regulatory Reform Task Force in response to several Executive Orders. The regulatory

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programs that affect domestic manufacturers also affect other industrial sectors, and the Task Force is looking to synthesize information from multiple sources, including the Department of Commerce RFI, comments in EPA's docket, input from public meetings, and recommendations from EPA programmatic offices to inform its work over the next few months. EPA believes through these efforts, the Agency can meaningfully improve its permitting and regulatory programs to reduce burdens on domestic manufacturers, consistent with the Administration's directives.

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Appendices

Appendix A - includes background documents summarizing EPA's past efforts to quantify time taken for permit issuance

A.1 Timely Issuance of Permit Renewals and Significant Modifications under Title V, 2007. (chapter 3, pages 3-1 to 3-6)
A.2 NSR 90 Day Review, 2001. (Page 8)
A.3 Final Report to the Clean Air Act Advisory Committee, 2006. (executive summary and introduction)
A.4 RCRA Permit Modifications Report, 2016. (Page 15)
A.5 NPDES Permit Issuance Timeframes

Appendix B - includes process maps addressing relevant EPA statutes, associated regulatory programs, and related permitting processes.

B.1 Hazardous Waste, Treatment, Storage, and Disposal Facilities Regulations, 2011 (pages 3-10)
B.2 NPDES Permit Writers Manual, 2010. (Pages 3-1 to 3-6)
B.3 Clean Air Act – Title V Permit Issuance Timeline

A.1 Timely Issuance of Permit Renewals and Significant Modifications under Title V, 2007. (chapter 3, pages 3-1 to 3-6)

Link- timely issuance...

This evaluation examines the performance of state and local air permitting agencies ("agencies") with regard to the timely issuance of Title V permit renewals and significant permit modifications (SPMs). Our results indicate that over the past five years agencies have steadily improved their ability to issue renewal permits and SPMs on time, i.e., within the federal deadline of 18 months (540 days) from the receipt of a complete application.[1] In 2001, agencies issued approximately 68 percent of their permit renewals on time; by 2005, this percentage increased to approximately 94 percent. We noted a similar trend for the proportion of SPMs issued on time. In the same five-year span, agencies also significantly reduced their issuance timeframes for renewal permits and SPMs. Overall, the average time to issue renewal permits fell from 576 days in 2001 to 257 days in 2005, a reduction of approximately 55 percent. The average time to issue SPMs fell by 32 percent from 504 days in 2001 to 342 days in 2005.

Despite these trends, agencies continue to face challenges at various stages in the issuance process that can adversely affect their ability to draft, notice, and finalize renewal permits and SPMs on time. These challenges include internal factors such as competing priorities for agency staff, as well as external factors such as the tendency of applicants to submit incomplete applications and engage in negotiations with agencies over permit terms. A number of agencies have implemented policies or practices to address these various challenges and have identified ways for EPA to assist them in their efforts. This chapter discusses these challenges and specific actions taken by agencies to address them. The discussion is organized by the three overarching evaluation questions outlined in Chapter 1:

1) What are the performance characteristics, e.g., timeframes and procedures, in each step of state and local processes for issuing Title V permit renewals and significant permit modifications?

2) What are the root causes or factors that contribute to the performance characteristics associated with the issuance process for Title V permit renewals and significant permit modifications?

[1] 40 CFR Part 70.7(a)(2) directs air permitting agencies to "take final action on each permit application (including a request for permit modification or renewal) within 18 months, or such lesser time approved by the Administrator, after receiving a complete application." The Office of Management and Budget (OMB) adopted this regulatory deadline as a performance measure in its Performance Assessment Rating Tool (PART) review of EPA's Air Quality and Permit Program conducted in 2005 (available at http://www.whitehouse.gov/omb/expectmore/detail.10004377.2005.html). EPA has interpreted the PART measure as 18 months from the date on which an application is received to the date a final permit is issued.

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3) What actions could federal, state, or local agencies take that would increase the efficiency and effectiveness of the issuance process for Title V permit renewals and significant permit modifications?

PERFORMANCE CHARACTERISTICS AND PROCESSES FOR PERMIT ISSUANCE

The evaluation's first objective is to better understand state and local agency procedures as part of the overall process for issuing renewals and SPMs, as well as the timeframes in which agencies complete permit issuances based on these procedures. This section presents issuance data that provide insights into agency procedures and context for the subsequent discussion of factors influencing timeliness in this report. We employed two approaches to ascertain agency processes and performance. In the first, we utilized agency responses to questions about issuance procedures to characterize the basic steps in the issuance process and estimate the range of timeframes for each step (see Tables 3-1 and 3-2). In the second, we used agency-supplied data on actual experiences related to rates of late issuance and issuance times for permit renewals and SPMs (see Appendix E and Figures 3-1 through 3-4).

Procedural Timeframes for Permit Issuance

With a few exceptions, the air permitting agencies follow the same basic protocol for the issuance of Title V permit renewals and SPMs outlined in the logic model in Chapter 1. (Details on each agency's procedures and timeframes are included in Appendix C.) These include the following steps:

1) The Title V source submits an application for a permit renewal or SPM (within six months of permit expiration for renewals). All 10 agencies reported receiving the majority of permit renewal applications on time, i.e., within six months of permit expiration. A number of agencies have taken additional steps to ensure that the applications they receive are complete as well as timely. MDE, MPCA, NJDEP, and OR DEQ send facilities the forms and/or instructions needed for completing their applications. Other agencies, such as BAAQMD, CT DEP, KDHE, TCEQ, and UT DEQ refer applicants to their websites where forms and instructions are provided.

2) The agency receives the application, conducts an administrative review, and makes a completeness determination. All 10 agencies have adopted the federal 60-day deadline for notifying facilities that their renewal applications are missing information before they are automatically deemed administratively complete.[2] A majority of agencies, including BAAQMD, KDHE, MDE, NJDEP, OR DEQ, and UT DEQ, perform their completeness determinations earlier. FL DEP and TCEQ do not perform an administrative completeness review (ACR) independently from their technical review. FL DEP conducts its administrative and technical review during the initial 60-day completeness period. At the TCEQ, applications are automatically deemed administratively complete within 60 days. The ACR conducted by MPCA is

[2] 40 CFR Part 70.7(a)(4).

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limited to a cursory review of the components elements of the application forms, so most applications are deemed administratively complete.

3) If the application is incomplete, the agency notifies the applicant that additional information is needed to deem the application complete.

4) If the application is complete, the agency prepares a draft permit.

5) The agency notices the draft permit, responds to any comments received during this period, and holds public hearings, if requested.

6) The agency submits the draft permit to EPA for review. BAAQMD, CT DEP, KDHE, MDE, MPCA, TCEQ have implemented the practice of concurrent review whereby EPA begins its 45-day review of a draft permit simultaneously with the start of the public comment period. FL DEP has recently initiated concurrent review although it has not used it for any permit renewals or SPMs to date.

Tables 3-1 and 3-2 present the minimum and maximum timeframes we estimated for each step in the issuance process for permit renewals and SPMs (measured from application receipt to final permit issuance). We based these estimates on composite data obtained from permitting agency questionnaire responses, follow-up interviews, and supplemental materials provided by each agency. The minimum and maximum numbers reflect variation among agencies in the timing and procedural composition of each step, e.g., an abbreviated or integrated ACR. To construct these timeframes we assumed the following:

- All agencies make their completeness determinations within 60 days in accordance with the federal requirement, regardless of whether they conduct a detailed ACR or a combined administrative/technical review prior to permit drafting.

- All applications require applicants to supply additional information to enable permit drafting; the minimum and maximum number of days are based on agency deadlines for receipt of requested information and reported average applicant response times.

- Only a few draft permits receive public comments during the public comment period. Fewer require a public hearing. The minimum number of days in this period includes the time to notice the draft and respond to comments; the maximum number of days includes the above plus additional time to notice, conduct, and respond to comments made during a public hearing.

- The timeframe for the EPA Review includes the time to conduct a concurrent or sequential EPA review. For most agencies that use concurrent review, the minimum time is zero days, since the review is subsumed within the public comment period.

Using the minimum number of days for each procedural step, we estimated the issuance time for permit renewals to be less than 18 months, ranging from 8.6 to 17.6 months. For SPMs, it ranges from 6.2 to 12.6 months. This suggests that all agencies have the capacity to process

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applications and issue permits within the federally mandated timeframe. We estimated the maximum renewal permit issuance timeframes to exceed 18 months for all but three agencies; the mean timeframe is 22.6 months. Conversely, even under the longest time estimates, all but two agencies have the capacity to issue SPMs within 18 months; the mean timeframe is 17.0 months.

A closer examination of the average minimum and maximum timeframes for permit renewals and SPMs suggests that the time needed to draft permits and conduct public hearings has a greater impact overall on timeliness than other steps in the issuance process. This finding is supported by agency rankings of the factors that contribute most to delay. As Tables 3-1 and 3-2 show, the difference in the number of days it takes agencies to begin and complete drafting permit renewals compared to SPMs also suggests that, all else being equal, the drafting step presents more challenges for renewals. The factors that contribute to delay during these steps in the process are discussed in greater detail in the following section.

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Table 3-1 Estimated Agency Minimum and Maximum Time to Issue a Permit Renewal[a,b,c]

Agency	Days to Determine Initial Completeness		Days to Receipt of Additional Information		Days to Begin Drafting		Days to Complete Draft Permit		Days to Conduct Public Comment Period		Days to Complete EPA Review		Total Days from Application Receipt to Final Issuance		Total Months from Application Receipt to Issuance		Agency Permit Issuance Deadline	Conduct Detailed ACR	Use Concurrent Review
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max[1]	Min	Max	Min	Max	Min	Max			
MPCA	**60**	60	**30**	45	180	**180**	181	365	61	145	15	45	527	840	**17.6**	**28.0**	18 months[3]	No	Yes
UT DEQ	7	60	31	60	31	60	365	548	45	75	0	45	479	848	**16.0**	28.3		Yes	No[6]
CT DEP	60	60	31	45	91	180	181	365	90	150	0	45	453	845	15.1	28.2	12 months[2]	Yes	Yes
MDE	**12**	60	**30**	60	91	180	181	365	105	**195**	0	45	419	905	**14.0**	**30.2**	18 months[2]	Yes	Yes
BAAQMD	30	60	30	**60**	61	90	181	365	60	**120**	0	45	362	740	12.1	**24.7**	18 months[3]	No	Yes
FL DEP	**60**	60	**90**	150	**30**	30	**60**	60	67	**88**	55	55	362	443	**12.1**	**14.8**	90 days[4]	No[8]	No[5]
OR DEQ	30	60	15	30	61	90	181	240	51	**125**	5	45	343	590	11.4	**19.7**		Yes	No
TCEQ	60	60	30	45	**30**	30	90	90	90	**150**	0	45	300	420	**10.0**	**14.0**	330 days[2]	No	Yes
KDHE	7	60	15	30	91	180	91	180	55	120	0	45	259	615	8.6	20.5	180 days[2]	Yes	Yes
NJDEP	**1**	60	**15**	30	61	90	91	180	46	120	45	45	259	525	**8.6**	17.5		Yes	No
Averages[7]	33	60	32	56	73	111	160	276	67	126	12	46	376	677	12.5	22.6			

Notes:

[a]IEc based its estimates on responses to the questionnaire, follow-up interview questions, and data from supplemental materials.

[b]Agencies are sorted by the minimum total months from application receipt to issuance, from highest to lowest.

[c]Maximum totals in **bold** may be larger if the agency reported a range of days that equals or exceeds a given number. Minimum totals in **bold** may be lower if the agency reported a range of days that equals or is less than a given number.

[1]Includes timeframe for components under the minimum scenario (notice publication, public comment, response to comments) plus the time to notice and conduct a public hearing.

[2]From the date of receipt of application.

[3]From the date of receipt of complete application.

[4]Issuance of draft permit from completeness determination date.

[5]Although FL DEP is now using concurrent review for permit renewals and SPMs, the agency did not use it for permit renewals and SPMs included in the timeframe of this review.

[6]Although officially sequential, EPA conducts an early review during the public comment period, completing it within 2-3 weeks for some permits.

[7]Rounded to the nearest day.

[8]FL DEP does not conduct a discrete ACR but rather a combined administrative and technical review.

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Table 3-2 Estimated Agency Minimum and Maximum Time to Issue a Significant Permit Modification[a,b,c]

Agency	Days to Determine Initial Completeness		Days to Receipt of Additional Information		Days to Begin Drafting		Days to Complete Draft Permit		Days to Conduct Public Comment Period		Days to Complete EPA Review		Total Days from Application Receipt to Final Issuance		Total Months from Application Receipt to Issuance		Agency Permit Issuance Deadline	Conduct Detailed ACR	Use Concurrent Review
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max [1]	Min	Max	Min	Max	Min	Max			
CT DEP	60	60	31	45	61	90	181	365	45	105	0	45	378	710	12.6	23.7	12 months[2]	Yes	Yes
BAAQMD	30	60	30	**60**	61	90	181	365	60	**120**	0	45	362	740	12.1	**24.7**	18 months[3]	No	Yes
FL DEP	**60**	60	**90**	150	**30**	30	**60**	60	67	**88**	55	55	362	443	**12.1**	**14.8**	90 days[4]	No[9]	No[5]
TCEQ	60	60	15	30	**30**	30	90	90	90	**150**	0	45	285	405	**9.5**	**13.5**	330 days[2]	No	Yes
MPCA	**60**	60	**15**	30	**30**	30	91	180	61	145	15	45	272	490	**9.1**	16.3	18 months[8]	No	Yes
KDHE	7	60	15	30	61	90	91	180	55	120	0	45	229	525	7.6	17.5		Yes	Yes
NJDEP	1	60	15	30	31	60	91	180	**45**	105	45	**45**	228	480	**7.6**	**16.0**		Yes	No
OR DEQ	30	60	**15**	15	**30**	30	91	180	51	**125**	5	45	222	455	**7.4**	**15.2**		Yes	No
UT DEQ	**7**	60	15	30	**30**	30	**90**	90	45	75	0	45	187	330	**6.2**	11.0		Yes	No[6]
Averages[7]	35	60	27	47	40	53	107	188	58	115	13	46	281	509	9.4	17.0			

Notes:

[a] IEc based its estimates on responses to the questionnaire, follow-up interview questions, and data from supplemental materials.

[b] Agencies are sorted by the minimum total months from application receipt to issuance, from highest to lowest.

[c] Maximum totals in **bold** may be larger if the agency reported a range of days that equals or exceeds a given number. Minimum totals in **bold** may be lower if the agency reported a range of days that equals or is less than a given number.

[1] Includes timeframe for components under the minimum scenario (notice publication, public comment, response to comments) plus the time to notice and conduct a public hearing.

[2] From the date of receipt of application.

[3] From the date of receipt of complete application.

[4] Issuance of draft permit from completeness determination date.

[5] Although FL DEP is now using concurrent review for permit renewals and SPMs, the agency did not use it for permit renewals and SPMs included in the timeframe of this review.

[6] Although officially sequential, EPA conducts an early review during the public comment period, completing it within 2-3 weeks for some permits.

[7] Rounded to the nearest day.

[8] If the SPM is determined to be "a major permit amendment to construct a modification," per state regulations, the agency must take final action on the permit within 14 months from the date an application is deemed complete if there are no public meeting/hearing and no significant adverse comments. Otherwise the deadline is 18 months for submittal of a complete permit application.

[9] FL DEP does not conduct a discrete ACR but rather a combined administrative and technical review.

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A.2 NSR 90 Day Review, 2001. (Page 8)

Link- NSR 90 day review

Docket A-2001-19
Document II-A-01

NSR 90-Day Review Background Paper

June 22, 2001

current actual emissions to their post-change potential emissions. For the electric utility industry, its 1992 "WEPCO rule" calls for comparing current actual emissions to post-change projected actual emissions.

The Permit Application Process

Once a source determines that NSR applies, it must then prepare and file a permit application. The basic steps associated with the permit application and issuance process include: (1) preparation of the permit application and participation in any associated pre-permit application meetings; (2) issuance of permit application completeness determination by the State; (3) development and negotiation of draft permit; (4) opportunity for public notice and comment on the draft permit; (5) response of permitting authority to public comments, if any; (6) possible administrative and judicial appeals. In addition the source must address any state and local requirements associated with the project. The time and resources expended on preparing and negotiating the content of the application and addressing the NSR or PSD requirements can vary depending on the quality of the information contained in the permit application and the nature, extent and environmental impact of the proposed project. Additionally, the level of public participation can also impact the resources associated with the application process. Sometimes sources will participate in meetings with the state permitting authority and other affected parties such as EPA, local government representatives, Federal Land Managers and citizens groups prior to filing the permit application to discuss these requirements. The following discussion describes the NSR or PSD requirements that must be addressed in the permit application process.

Basic Nonattainment NSR Requirements

The Nonattainment NSR requirements apply to sources that construct or modify in an area that is designated nonattainment for one or more pollutants. These provisions apply to the pollutants for which the area is in nonattainment. If a source increases emissions of a nonattainment pollutant and increases emissions of an attainment pollutant the following provisions apply only to the nonattainment pollutant. For the attainment pollutant(s), the PSD provisions, discussed later, would apply.

New major sources and existing major sources undertaking major modifications subject to nonattainment NSR must apply state of the art emission controls that meet the lowest achievable emissions rate (LAER). LAER is based on the most stringent emission limitation in any State's SIP, or achieved in practice by the source category under review.

In order to get a nonattainment NSR permit, the applicant must also offset its emission increase by securing emission reductions from other sources in the area. The amount of the offset must be as great or greater than the new increase, and is based on the severity of the area's nonattainment classification. The more polluted the air is where the source is locating or expanding, the greater the emissions reductions required to offset the proposed increase. Offsets must be real reductions in emissions, not otherwise required by the Clean Air Act, must be enforceable by the EPA, result in a positive net air quality benefit and assure reasonable progress towards attaining the NAAQS. In general, offsets must be secured for the entire life of the source. However, under EPA's Economic Incentives Program, a source does not need to have the full amount of the offsets necessary to cover the entire life of the source at the time the source begins operation. Instead, the

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source can purchase additional offsets periodically to meet the offset requirement.

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Each applicant must also conduct an analysis of "alternative sites, sizes, production processes, and environmental control techniques...[that] demonstrates the benefits of the proposed source significantly outweigh the environmental and social costs of its location, construction, or modification." The applicant must also certify that all of its other sources operating within the state are in compliance with the Clean Air Act and SIP requirements. Finally, the public must be given adequate notice and opportunity to comment on each permit application.

In addition to the basic steps identified above, when preparing a permit application, the applicant must research and propose LAER for the source category at issue and secure valid offsets as a condition of the project's approval.

Basic PSD Requirements

New major sources and existing sources that undertake major modifications that are subject to PSD must apply best available control technology (BACT). When preparing a BACT analysis, the permit applicant must typically undertake the following steps: (1) identify available pollution control options; (2) eliminate the technically infeasible options; (3) rank the remaining control technologies by control effectiveness; (4) evaluate the most effective controls (considering energy, environmental, and economic impacts) and document the results; and (5) discuss the appropriate BACT selection with the permitting authority. The permitting authority then specifies an emission limit for the source that represents BACT.

Each PSD applicant must also perform an air quality analysis, which may include pre-application monitoring data, to demonstrate that the new emission increase will not cause or contribute to a violation of any applicable NAAQS or result in a significant deterioration of the air quality. Finally, each applicant must also conduct an analysis to ensure that the increase does not result in adverse impact on air quality related values, including visibility, that affect designated Class I areas, such as wilderness areas and national parks.

Changes that do not trigger NSR

There are a number of ways that sources can undertake new construction or modification without the need for a major NSR permit. First, as noted above, there are certain activities that are exempt from NSR because they are defined in the regulations as exclusions from the definition of a physical change or change in the method of operation. For example, a routine change is exempt from NSR. Certain pollution control projects are also exempt from NSR, even those that increase emissions, if they meet environmental safeguards established by EPA.

Even if a change does not qualify for one of these exemptions, a change at a major source does not trigger NSR if the emissions increase is below the level defined as significant. Many projects have emissions increases that are below these levels and never trigger NSR. Where a project's maximum capacity to emit would be above the significance levels, a source often uses a common NSR avoidance strategy -- a limit on potential to emit, or PTE limit. In a PTE limit, a source agrees to limit the size of the proposed project's emissions increase by taking a permit

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limit to keep emissions below the significance level. Such limitations can be accomplished by installing modern pollution controls, or by limiting some unit's operation (e.g., limiting fuel burned or hours operated)[11].

Furthermore, even if the proposed change would result in a significant increase and cannot be limited as just described, the source may offer past or future emissions decreases at other units to offset the increase from the proposed change. Many more sources rely on netting or PTE limits to avoid NSR than actually obtain NSR permits. These transactions can result in significant emissions reductions, but a full review of these benefits is beyond the scope of this report.

General data on the NSR program's implementation

Preliminary estimates based on EPA's most recent data indicate that approximately 250 facilities apply for a PSD or nonattainment NSR permits annually. There are approximately 20,000 sources that would be classified as major under the Clean Air Act, and many more stationary sources that are not large enough to be called major. Specific permitting data for utilities and refineries are presented in the sector-specific portions of this paper; the data in this section pertain to all source categories.

Based on an EPA review of about 900 permits since 1997, the average time needed to obtain a major NSR or PSD permit, across all industries, is approximately 7 months from receipt of the complete permit application. Specific data for the electric generation and refining industries are reported in the sector-specific sections of this paper. In recent years, permitting times have been reduced for all source types.

Figure 1: Average Permitting Time for PSD permits*

Permitting Time 1997 - 1998	Permitting Time 1999 - early 2001	Overall Average Time 1997 - 2001
Average: 8 - 9 months Range: 1.5 – 35 months	Average: 6 - 7 months Range: 3 - 12 months	7.2 months

*These times are based on a total of 391 PSD sources for which sufficient data were available to calculate permitting time. Permitting time is defined to include the time period from the date on which the permit application is filed through the date on which the final permit is issued.

Improved permitting time can be explained in part by permit applicants having more pre-application meetings with the permitting agency and submitting applications with what is believed to be current BACT. Based on experience, the most common sources of delay in permit issuance are the submittal of an incomplete application, the selection of a BACT option that the permitting authority believes to be less stringent than required, and public opposition to the permitting authority's draft BACT determination. Over time, as permit engineers from the industrial sector, the permitting authority, and EPA become familiar with specific issues, permitting can be done faster, as has recently been the case with turbines. Finally, recent emphasis by EPA, state, and local permitting authorities on permitting for new electric generating capacity and refining capacity appears to be resulting in shorter permitting processes.

[11] In addition to limiting the PTE of a project to stay below the significance levels for a major modification, some sources limit their entire facility PTE to levels that keep the source from being classified as a major source.

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General environmental impacts of NSR

Recent work by EPA indicates that over the period from 1997-1999, the BACT component of the PSD program has resulted in emissions reductions of over 4 million tons (or an annual average of about 1.4 million tons) compared to what emissions would have been if the controls otherwise required in the absence of PSD had been applied instead[12]. These data are based on a thorough review of approximately 900 PSD permits issued since 1997. Figure 2 summarizes these data by pollutant.

Figure 2: Estimated Emissions Avoided Due to PSD BACT Permitting (1997 – 1999) (short tons)

PM/PM10	180,000
SO2	1,260,000
NOx	2,540,000
CO	65,000
VOC	25,000
TOTAL	**4,100,000**
Annual average over time period	***1.4 million tons per year***

The review on which these numbers are based included only PSD permits. Therefore, these emissions reductions estimates do not include emissions reductions for control technology and offsets in nonattainment areas.

The emissions reductions that result from pollution control required under NSR are not the only way that the NSR program keeps pollution out of the air. Each year many companies make modifications to existing facilities, and even construct entirely new facilities, without obtaining and NSR permit by keeping emissions lower than the amounts for which permits are required. This process is sometimes referred to as "netting out" of NSR. [13] Because EPA is usually not involved when companies make changes that do not require NSR permits, we do not have data on the amount of pollution avoided as a result.

Benefits Associated with Electricity Generating Emissions Reductions Realized Under the NSR Program

[12] Typically, in the absence of BACT, the controls required would be a federal New Source Performance Standard (NSPS), and/or a limit from an applicable State Implementation Plan (SIP).

[13] For example, if a power plant located in an attainment area makes a change that would increase its emissions of NOx by 50 tons per year but at the same time installs pollution control technology that would reduce its NOx emissions by 35 tons per year, the plant would not have to obtain an NSR permit because its net emissions increase (15 tons per year) would be less than the 40 tons per year that makes a change a major modification.

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A.3 Final Report to the Clean Air Act Advisory Committee, 2006. (executive summary and introduction)

link to full report

Title V TaskForce

Final Report to the Clean Air Act Advisory Committee

Title V Implementation Experience
April 2006

FINAL REPORT
TO THE CLEAN AIR ACT ADVISORY COMMITTEE ON THE TITLE V IMPLEMENTATION EXPERIENCE

Prepared by:

The Title V Task Force

April 2006

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

MAR 29 2006

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Task Force on Title V Implementation Experience

FROM: for William T. Harnett Michael A. Ling
Director, Air Quality Policy Division (C504-01)

TO: Clean Air Act Advisory Committee (CAAAC) Permitting, NSR and Toxics Subcommittee

Please find enclosed the Final Report of the Task Force on Title V Implementation Experience. You formed the Task Force in May 2004 to review the implementation and performance of the operating permit program under title V of the 1990 Clean Air Act Amendments. The Task Force has compiled a substantial body of public testimony and written comments concerning what is working or not working in the title V permit program. Collectively, the Task Force members and EPA spent thousands of hours over the past two years on this effort. Included in the report are a number of recommendations for consideration by CAAAC and EPA. These recommendations and the discussion accompanying them are the culmination of a great amount of thoughtful deliberation about how the program can be better implemented. Consistent with your charge, the report reflects the core issues of concern to all stakeholder groups and all of their perspectives of how best to address them. The Task Force hopes that this work product will be very useful to both the CAAAC and to EPA.

EPA would like to express its gratitude to all members of the Task Force for their dedication to this project and the large amounts of time they devoted to its completion. EPA and the public at large are deeply indebted to all members of the Task Force for the careful translation of the public testimony into recommendations for the improvement of many areas of the title V program.

The Task Force would like me to pass along their thanks to the EPA staff for their hard work in facilitating this process as well as to recognize the efforts of EC/R Incorporated representatives for arranging our meetings and for their valiant efforts to prepare notes on our activities.

We entrust this report to your deliberation and seek your direction on how EPA should proceed to implement the Task Force's recommendations.

EXECUTIVE SUMMARY

In 2004, the Clean Air Act Advisory Committee (CAAAC) established the Task Force on Title V Implementation Experience ("Task Force") to report on stakeholder experience with implementation of the Title V operating permit program. The 18-member Task Force, which consisted of representatives from industry, environmental groups, and State and local agencies, used public meetings, written comments, and individual experience as resources to identify and evaluate the Title V program and develop recommendations. This report represents a compilation of the issues identified and includes summaries of Task Force discussions, key supporting stakeholder experience, conclusions, and recommendations. Since the report represents the perspectives of the various stakeholders there are some issues and recommendations with Task Force consensus, and others where the report notes the differences.

As background, the Clean Air Act of 1990 provided for the development of a national operating permitting system for major sources of air pollution. Under this new section (Title V), State and local air pollution control agencies would issue permits that would contain all of the requirements that were needed for a source to maintain compliance with State and Federal air pollution control regulations. Furthermore, the Title V permit would be directly enforceable by the permitting authority issuing the permit and EPA. It is also subject to the citizen suit provisions of the Act. From the beginning, implementation of Title V has been difficult and controversial. After 15 years, there are still significant issues associated with the operation of the program.

The Task Force identified a number of program benefits that were generally recognized across the spectrum of stakeholders. These include:

- Recording of applicable requirements in one document clarifies regulatory requirements for permitting agencies, the public, and facilities.
- Improved public participation at various stages of the permitting process.
- Improved communication between regulatory agencies and facilities has resulted in better permits and mutual understanding of compliance requirements.
- Establishment of a funding mechanism to provide resources to administer State permit programs.
- Improved source compliance assurance systems, driven by Responsible Official obligations and reporting of deviations and a strengthened penalty/enforcement mechanism.

In evaluating the Title V program, the Task Force categorized key issues into 19 different areas. For each topic the Task Force characterized the issue, developed recommendations, summarized Task Force discussions, and included supporting comments from public hearings and written testimony. The topics included in this report are:

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- Program Overview Papers
  - Benefits
  - Costs
- Content Issues
  - Incorporation of Applicable Requirements
  - Insignificant Activities and Emission Units
  - Monitoring
  - Title I/Title V Interface
  - New Substantive Requirements
  - Permit Definitiveness
  - Compliance Certification
  - Startup, Shutdown, and Malfunction
  - Compliance Schedules
- Process Issues
  - EPA Review of Proposed Permits
  - Public Access to Documents
  - Public Hearings
  - Public Notice Throughout Process
  - Statement of Basis
  - Responses to Public Comments
  - Permit Revisions and Operational Flexibility
  - Appeals and Petitions

The Task Force developed an extensive list of recommendations. Although there were no external constraints on the scope of the recommendations of the Task Force, the members recognized that recommendations which could be implemented under current legislative/regulatory authority would be easier, and more timely, to implement. The recommendations are included in each topic area. Given the diverse views of the Task Force there is no consensus list of recommendations or conclusions, although the votes shown on each recommendation indicate the degree of consensus.

The Task Force believes that an EPA assessment and implementation of many of the recommendations will provide for an improved Title V operating permit program. A program that achieves program objectives in a more efficient manner will benefit all stakeholders.

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1. INTRODUCTION

1.1 CHARGE TO THE CAAAC TASK FORCE ON TITLE V IMPLEMENTATION EXPERIENCE

The Permitting Subcommittee of the Clean Air Act Advisory Committee establishes the Task Force on Title V Implementation Experience, and charges it with this objective:

The Task Force will report to the committee on the experiences of stakeholders who have been working in the Title V permitting arena (*i.e.,* a "State of the Title V program" report). The report should reflect the perspectives of all stakeholder groups, and should reflect an effort to answer two questions:

1. How well is the Title V program performing?

For example, has it:

- Resulted in permits that clearly compile all a source's applicable requirements into a single document?
- Enabled sources, States, EPA, and the public to better understand the requirements that apply to a source?
- Enabled sources, States, EPA and the public to better know whether a source is meeting these requirements?
- Triggered actions that result in better compliance with the CAA?
- Allowed for better enforcement of CAA requirements?
- Improved citizen participation in air quality decisions by involving the public in the issuance of permits?
- Improved EPA's ability to implement and oversee CAA programs, including toxics, acid rain, etc?
- Enhanced governments' ability to do air quality planning?
- Ensured self-funding adequate to run effective programs?
- Resulted in better air quality?

2. What elements of the program are working well/poorly?

The answers to these questions should, to the maximum extent possible, reflect consideration of stakeholders' real world experience with the Title V program, and should include examples – good and bad – that illustrate this experience. Where possible, emphasis should be placed on actual examples, but in some cases, hypothetical examples may provide the best illustration.

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When the Task Force has gathered sufficient information to characterize the various perspectives on Title V implementation experience, as described above, it may also elect to offer recommendations for improving the Title V program.
The report and any recommendations made should reflect the full range of stakeholder perspectives discussed. The Task Force may characterize consensus statements and recommendations as such, but where there is not consensus, the report should detail the full range of issues discussed and views expressed during the process.

In order to ensure that the discussions reflect sufficient depth, but also ensure a broad collection of stakeholder perspectives, the Subcommittee recommends that the Task Force conduct at least three full-day meetings, and have at least one meeting outside of the Washington D.C. area. The EPA will explore options for supporting the Subcommittee's work, such as providing transcripts and summaries of these meetings.

1.2 TITLE V TASK FORCE MEMBERS

State/local Permitting Agencies	
Rob Sliwinski and John Higgins	New York Department of Environmental Conservation (NY DEC)
Shelley Kaderly	Nebraska Department of Environmental Quality (NE DEQ)
Don van der Vaart	North Carolina Dept of Environmental Management (NC DEM)
Adan Schwartz	Bay Area Air Quality Management District (AQMD)
Bob Hodanbosi	Ohio Environmental Protection Agency (OH EPA)
Steve Hagle	Texas Council on Environmental Quality (TCEQ)
Environmental Advocacy Groups	
Karla Raettig and Kelly Haragan	Environmental Integrity Project
Marcie Keever	Our Children's Earth
Bob Palzer	Sierra Club
Verena Owen	Lake Co. (IL) Conservation Alliance
Keri Powell	New York Public Interest Research Group (NYPIRG)
Richard Van Frank	Improving Kids' Environment
Industry	
Shannon Broome	Air Permitting Forum
Lauren Freeman	Utility Air Regulatory Group (UARG)
Bernie Paul	Eli Lilly and Company
Bob Morehouse	ExxonMobil
Mike Wood	Weyerhaeuser Company
David Golden	Eastman Chemical

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Support and Facilitation

EPA	
Bill Harnett, Michael Ling and Ray Vogel	Office of Air Quality Planning and Standards
Steve Hitte	Region IV
Callie Videtich	Region VIII
Padmini Singh	Office of General Counsel
Carol Holmes	Office of Enforcement and Compliance Assistance
EC/R Incorporated	
Graham Fitzsimons	
Shannon Cox	
Lesley Stobert	
Steve Edgerton	
Kathy Boyer	

1.3 TASK FORCE METHODOLOGY

Selection of Task Force members

The formation of the Task Force and a public solicitation of candidates was announced in a May 17, 2004 Federal Register (69 FR 27921). With a goal of creating a reasonably small and diverse group, the EPA selected an 18-member Task Force comprised of experienced representatives from industry, environmental advocates and State and local agency officials.

Public Testimony

The charge from the CAAAC Permitting Subcommittee instructed the Title V Task Force to issue a report that "should reflect the perspectives of all stakeholder groups." The subcommittee recommended that the Task Force conduct at least three full-day meetings, at least one of which should be outside the Washington, D.C. area.

Consistent with its charge, the Task Force held three public meetings at these locations:

June 25, 2004	Washington D.C.
September 14, 2004	Chicago, IL
February 7, 2005	San Francisco, CA

In addition, a public conference call on November 15, 2004 was held with environmental advocates, to obtain testimony from those who might be unable to afford travel to one of the public meetings. Also a public conference call on February 8, 2005 was held with State and local agencies, because the Task Force believed that the public meetings up to that point had underrepresented the views of State and local permitting agencies. Industry stakeholders presented their views by appearing in person at the public meetings or filing written comments; however, they were not provided a separate conference call. From the meetings and conference calls, testimony was received from 74 speakers, of

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which 18 represented industry, 18 represented State and local agencies and 38 represented environmental advocacy groups.

Also, written comments were received until March 31, 2005. A total of 44 comment letters were received: 18 from industry, 13 from State and local agencies and 7 from environmental advocates. In addition, 34 studies and supporting documents were submitted to the docket.

Full text of the public testimony is available on www.epa.gov/caaac/titleV. The written comments are also available on www.epa.gov/caaac/titleV and on www.regulations.gov at docket (enter docket number OAR-2004-0075 into "advanced search"). In addition, sections of public testimony and written comments are liberally quoted or summarized in this report in many issue areas.

Identification of Issue Areas

In evaluating the input received, the Task Force divided the various comments into Issue Areas. (See Table 1.3-1). These Issue Areas are the ones of most interest to stakeholders and Task Force members. Therefore they don't necessarily reflect some of the original charge questions posed by the CAAAC. For example, there was very little input on items like air quality planning (one of the example CAAAC questions) so the Task Force did not focus on areas not highlighted by stakeholders. The goal of the Task Force was to cover a broad range of issues while giving meaningful treatment to each. This necessarily means that not every issue raised by stakeholders is reflected in the body of the report. The Task Force wishes to emphasize that its decision not to address in the body of the report a particular issue on which testimony was provided should not be interpreted as a decision that the issue is unimportant. Given our limited time, we attempted to prioritize the issues based on the degree of input received and the likelihood of having productive discussions within the Task Force.

Process for Developing Each Issue Area

Each Issue Area was taken on by small groups of Task Force members to frame the issues and sub-issues, to summarize the supporting information presented in the oral and written public comments and to suggest recommendations for consideration by the entire Task Force. Once issue papers were developed, face-to-face meetings were held to hear the viewpoints of each member of the Task Force, modify the framing of the issues or sub-issues within the topic if necessary, and discussing and voting on potential recommendations. Five face-to-face meetings were held from February 2005 to January 2006. In addition, the Task Force added days either before or after some public meetings to move its work forward. Finally, a large number of conference calls between the face-to-face meetings were held to discuss issue papers, to suggest and vote on recommendations and to discuss development of the report.

To ensure that all issues and potential recommendations were considered, we allowed anyone on the Task Force to suggest a recommendation and held discussions on all offered recommendations. In some cases, recommendations were modified to garner addi-

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tional support and thus may represent a compromise position by some or all persons voting in favor of a recommendation. Even if a proposed recommendation did not receive a majority of votes from members of the Task Force, we have included it in the issue paper to provide a complete picture of the issues we discussed and people's viewpoints. Thus, the term "recommendation" is used for all proposed recommendations whether or not a recommendation received a majority of votes from the group. It was our desire not to eliminate viewpoints simply because they were not held by a majority of members. At the same time, the nomenclature of "recommendation" should not be read to indicate that every recommendation is endorsed by all of the Task Force. To draw conclusions on how strongly a recommendation has the support of all Task Force members, the reader is directed to review the voting for each recommendation and the Discussion section in the paper.

Where possible, we also included in the Discussion section of a paper an explanation of the deliberations so that the reader can understand why someone may have supported, opposed, or abstained from voting for a particular recommendation. For example, a vote against a recommendation may have been based on a particular phrase of concern in the recommendation, or it may have been against the recommendation as a whole. While we cannot recreate the entire discussion (and we doubt anyone would want to read it if we could), to the extent possible, the summary of the Task Force discussions in each paper is intended to help the reader understand what concerns and policies motivated particular votes. We also included an option to abstain from a particular vote as well as to offer clarifications of a vote. The clarification option allowed members of the Task Force to explain their votes, *e.g.,* how they interpreted a particular word or phrase in the recommendation, or why they abstained from voting for the recommendation. Finally, although Task Force members participated in discussions and voted with the intent of representing the viewpoint of the organization they were representing to the best of their ability, the votes themselves are to some degree personal votes in that the Task Force did not open its process to allow the organizations themselves to vote on recommendations.

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The following areas were identified by the Task Force for the purpose of developing issue papers for further discussion. The order of this list is alphabetical and does not reflect any particular priority.

Table 1.3-1 Issue Areas identified by the Task Force

Topic	
1.	Compliance Certifications
2.	Compliance Schedules
3.	Definitiveness of Permit
4.	Deviation Reporting*
5.	EPA Review of Proposed Permits
6.	Incorporation of Applicable Requirements
7.	Insignificant Activities/ Emission Units
8.	Monitoring
9.	New Substantive Requirements
10.	Permit Reopening, Revisions, Current and Operational Flexibility
11.	Petitions and Appeals
12.	Program Benefits
13.	Program Costs
14.	Public Access to Documents
15.	Public Hearings
16.	Public Notice throughout Process
17.	Responses to Public Comments on Draft Permits
18.	Startup, Shutdown, and Malfunction
19.	Statement of Basis
20.	Title I/Title V (SIP gap; *e.g.,* old NSR)

* No paper was ultimately developed on this issue.

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1.4 REPORT STRUCTURE

As described in the Task Force Methodology section, this report represents a work product based on input received from four public meetings, two public conference calls to receive input, numerous written comments submitted, and extensive discussions at Task Force meetings from 2004-2006.

The report has been structured to achieve the following:

- To capture and summarize key input from multiple stakeholders on the Title V program as received in public hearing and written submittals.
- To capitalize on the experience of Task Force members to identify, characterize, and prioritize Title V issues.
- To develop recommendations to improve the Title V program. The recommendations go beyond the original charge to the Task Force (which focused on how the program is performing and elements of the program that are working well/poorly).

The main body of this report is organized by Issue Areas. The Task Force agreed to write an issue paper for each issue area in a standard format. Thus, each paper contains the topic, a brief Issue/Observation Description, Supporting Information, a Task Force Discussion Summary (based on meeting or conference call discussions), and, where possible, Recommendations. The issue papers were used by the Task Force to facilitate discussions but also evolved as a result of those discussions. The Supporting Information referenced above represents either a summary of public hearing input/written comments or direct quotes from the public meetings and written comments. Some papers include attachments with additional supporting information as well.

The report also includes a summary of the purpose of the Title V Operating Permit program. It is important in evaluating the Title V program to provide a frame of reference for the analysis. This section provides a brief overview of the legislative and regulatory history of the Title V program.

The final report includes all of the recommendations that were considered by the Task Force. So as to better represent the spectrum of viewpoints, the Task Force allowed its members broad latitude to offer recommendations. Members used the voting system to support, disagree with, or abstain from each recommendation, and could also offer alternate recommendations. As noted above, though time was devoted to discussion of each recommendation with the goal of moving towards consensus, each recommendation offered by a Task Force member was included in the report regardless of the degree of consensus behind it.

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A.4 RCRA Permit Modifications Report, 2016. (Page 15)

Link - RCRA Permit Modifications Report

RCRA

HAZARDOUS WASTE PERMITTING PROGRAM

Permit Modifications Needed: Safeguarding the Environment in the Face of Changing Business Needs

January 2016

United States Environmental Protection Agency

EPA530-R-15-001

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ACKNOWLEDGMENT
This report was developed by hazardous waste permitting experts in state environmental programs and in the Environmental Protection Agency (EPA)'s Office of Resource Conservation and Recovery and regional offices.

EPA wishes to acknowledge and thank the following contributors of this report: Paula Bansch (Indiana, IDEM), Bob Bullock (Idaho, DEQ), Jamie Burroughs (Tennessee, TDEC), Tricia Buzzell (EPA), Lilybeth Colón (EPA), Gail Hansen (EPA), Becky Holmes (Montana, DEQ), Denise Housley (EPA), Julia King-Collins (Virginia, DEQ), Matthew Loesel (EPA), Bud McCarty (North Carolina, DENR), Richard Nussbaum (Missouri, MDNR), Christine Roob (North Dakota, Dept. of Health), Tab Sommer (EPA), Will Steele (Louisiana, DEQ), and Farshad Vakili (California, DTSC).

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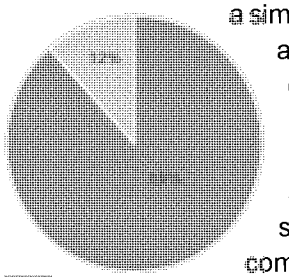
EXECUTIVE SUMMARY

The majority of facilities that are treating, storing, or disposing of hazardous waste have been issued permits under the Resource Conservation and Recovery Act (RCRA). The bulk of permitting activity has now shifted to responding to business needs and changes in facility operations while ensuring that the permitted conditions continue to be protective and prevent release. This report demonstrates the value of maintaining healthy RCRA permitting programs in order to efficiently respond to changes needed at facilities.

WHY HAZARDOUS WASTE PERMIT MODIFICATIONS ARE NECESSARY

Under RCRA, facilities managing hazardous waste must obtain a permit from their regulatory authority (i.e., the state or EPA). The purpose of the permit is to detail how a facility must comply with the RCRA regulations to ensure that hazardous waste management activities are conducted so as to prevent and address releases that could threaten public health and the environment and lead to potential cleanup obligations. These permits are site-specific and establish the technical and administrative standards to which a facility must adhere to legally and protectively manage hazardous waste. Thus, it is critical that modifications to the permit are made as necessary to enable the facility to effectively continue to operate treatment, storage, and disposal units.

Changes to permit conditions are often required to keep pace with evolving business practices, technology, cleanup decisions, and regulations. For example, permit modifications allow facilities to update technological systems, comply with new environmental standards, respond to changing waste streams, address financial assurance requirements, or simply improve their hazardous waste management practices. These changes in turn can support enhanced operational efficiency, economic development, conservation of resources, improved prevention of environmental releases, and cleanup progress.



See Section II.A for details

Most facilities may need to modify their permit more often than the permit needs to be renewed to accommodate time-critical business decisions, such as construction of a new waste management unit. Timely permit modifications enable facilities to efficiently expand and update their operations, adopt advanced greener technologies, remediate contamination, and address other vital business needs, while remaining protective of human health and the environment.

MOST PERMIT-RELATED WORK OCCURS AFTER INITIAL PERMIT ISSUANCE

The issuance of an initial permit reflects just the beginning of the permit-related work conducted by the regulatory authority. Over the life of a typical permitted hazardous waste management facility, significantly more time is devoted to permit maintenance than to permit issuance.

To better understand the workload associated with permit modifications, a group of state and EPA representatives reviewed data on permit modifications approved in 2011 through 2013. On average, 826 permit modifications were approved each year over the three-year period.

Permit modifications vary greatly in terms of complexity – a simple modification (Class 1 or Minor changes, such as a change in contact information) can be completed in as little as two or three hours. Class 1 modifications represent 83% of permit modifications reviewed during the period. More substantial modifications (Class 2, 3, and Major, such as adding a new waste management unit) combined represent 17% of permit modifications. The more substantial modifications can take up to 1,850 staff hours to address. Modifications that are technically complicated or have a high degree of public interest can take over a year to finalize (in addition to the 105 days of public review for Class 3's). See Section III for the process and timeframes for different classes of modifications.

Facilities that need permit maintenance are a large percentage (88%) of the RCRA permitting program's priority workload. However, the work has not been fully communicated or understood since modifications are not currently recognized under EPA performance goals and are not addressed in most state-EPA planning and budget negotiations. In that regard, this report presents a first look at the story of permit modifications, including the workload expended by states and EPA and the outcomes achieved for the environment and regulated community.

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1. Modifications Types Based on Regulatory Descriptions
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INTRODUCTION

A. Purpose of this Report

The purpose of this report is to describe the changing nature of RCRA hazardous waste permitting work and demonstrate how an adequate and effective permit program is vital, not only for initial permits, but also throughout the permit term to enable necessary permit maintenance activities. Permit conditions that are developed when permits are initially issued frequently need to be revised during the permit term to address evolving facility conditions, for example, in response to business changes, as well as changes in applicable regulatory requirements. Permit maintenance, including permit modification, assures that permits remain effective, and allows owners and operators to adjust facility operations to meet changing conditions and demands.

This report highlights the workload associated with maintaining permits and describes why permit modifications are critical in order to enable improved business operations while maintaining protection of human health and the environment.

B. Background

The EPA established comprehensive protective national standards for managing solid and hazardous waste. These regulations for treatment, storage, and disposal facilities ensure that facilities that manage these wastes have the necessary controls to safeguard communities and the environment, while facilitating commerce by supporting an effective waste management structure. These controls are imposed primarily through permits and these permits are predominantly issued by authorized states.[1]

Permits are essential to making the RCRA Subtitle C regulatory program work, since it is through the permitting process that the EPA or the states apply standards to hazardous waste treatment, storage, and disposal facilities (TSDFs). With permits and other enforceable waste management controls, RCRA actively protects the health of communities near hazardous waste management facilities, including the estimated 20 million people living within a mile of these facilities.[2] For example, RCRA requirements for landfills to install liners and leachate collection systems prevent hazardous contaminants from migrating into soil and potentially into surface water and groundwater, which are sources of drinking water. Furthermore, by containing leaks and spills, RCRA permit controls safeguard families and their homes from possible exposure. Permits also protect the public from hazardous air emissions by regulating hazardous waste combustors, including incinerators as well as boilers and commercial and industrial furnaces that combust hazardous waste, and by ensuring that volatile waste is properly contained and managed.

The public plays an important role in the permitting process for hazardous waste facilities. They and other interested parties can contribute valuable information and ideas that improve the quality of both agency decisions and permit applications. EPA has written regulations that create opportunities for the public to

[1] EPA Regions implement the RCRA program in Alaska, Iowa, and some territories. EPA regions also implement certain parts of the program for which some states have not yet been authorized (e.g., corrective action and some HSWA combustion regulations).
[2] Estimate drawn from an analysis that merged facility size and location information from RCRAInfo with population data, at the block and block group levels, from the U.S. Census Bureau's 2000 Census. The demographics were captured around the total number of facilities that have approved controls in place (e.g., permits and other approved controls) that result in the protection of this population (20 million people).

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learn about RCRA activities and give input during the process for permit issuance and for modifications. There are meetings, comment periods, and hearings specifically for the public to engage companies and regulators in a dialogue. Furthermore, EPA encourages permitting agencies, permit holders or applicants, and other interested parties to provide additional public participation activities where it will be helpful.

Since the program has been implemented, permits and other enforceable controls have been put in place to prevent dangerous releases at over 20,000 units.[3] Almost half of those units continue to require some level of oversight.[4] The states (and EPA) regularly issue, modify, and update RCRA permits for hazardous waste units (such as incinerators and landfills) at facilities that treat, store, or dispose of hazardous waste. These RCRA permits establish the waste management activities a facility can conduct as well as the conditions under which it can conduct them.

Over the life of a typical permitted hazardous waste management facility, significantly more time is devoted to permit maintenance than to permit issuance. Permit maintenance involves a number of activities among which permit modifications are the most significant. The work involved after permit issuance/reissuance and the results of those efforts have been largely unrecognized mainly because RCRA permit modifications have not been included under EPA performance goals. This paper tells the story of permit modifications and the important role they play in keeping permits current. It also describes common challenges and complexities inherent in the permit modification process and highlights case studies that offer a glimpse of the content, process, and workload.

With facilities constantly changing, it is critical that states and EPA maintain sufficient expertise and resources to process permits in a timely manner and allow businesses, especially those in the manufacturing sector, the opportunity to adjust to variable markets. Although the vast majority of hazardous waste management facilities have permits in place, there is a continuing challenge to keep pace with technology in a way that encourages safe and innovative waste management.

C. Organization of this Report

This report is divided into two primary components:

- **Part 1** provides information on the permit modification process. It describes what happens to a facility after it has received a permit, discusses why permit modifications have been largely an "untold story" in light of the focus on issuing and renewing permits, and provides facts and figures to set context for the workload associated with responding to modification requests.

- **Part 2** presents a series of case studies that show permit modifications "in action." The case studies describe real-world situations where the state permitting programs and businesses have worked together at facility improvements – where changes to permits continue to ensure proper safeguards remain in place and allow companies to respond to changing business needs or pursue innovative approaches to responsible hazardous waste management.

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[3] These units have met the criteria for "approved controls in place to prevent release," per the unit information entered into RCRAInfo. This includes historical records. See the GPRA "approved controls" description in Appendix 2.

[4] The oversight total (9,000 units) is from RCRAInfo in the "Full Oversight Workload for Permitting (Operating and Post-closure) and Closure Report" as of 3-12-14.

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PART 1

I. WHAT HAPPENS TO A FACILITY AFTER IT IS PERMITTED?

Permit Issued/ Reissued

Under RCRA, facilities must have a hazardous waste permit for units that treat, store, or dispose of hazardous waste. RCRA permits provide facility owners and operators with the legal authority to treat, store, or dispose of hazardous waste and detail how the facility must operate in order to comply with the regulations. The final permit also takes public input into consideration.

Permits are issued for a maximum of ten years (although permits can be administratively continued). This permit term limit ensures that facilities are periodically reviewed and requirements are updated as necessary.

Examples of Changes over the Life of a Permit

- Operating -

1. Change waste streams managed
2. Add capacity in existing units
3. Incorporate new units in the permit
4. Comply with new regulations (e.g., for incinerator units)
5. Improve waste management in order to save costs and conserve natural resources
6. Upgrade to more efficient/green technologies
7. New ownership triggering financial assurance reviews

- Closure, Post-Closure, Facility-Wide Cleanup -

1. Close storage tanks/remove conditions for unit
2. Improve cleanup process for historic contamination
3. Institute and assess new monthly groundwater monitoring
4. Select final remedy for facility-wide cleanup
5. Extend post-closure care period for landfills

- Recurring Changes -

1. Change in the general permit provisions (e.g., schedule of compliance, corrections, adjustment of unit conditions)
2. Change in the general facility standards (e.g., emergency response/contingency, sampling, and analysis)

EPA views permits as living documents that can be modified to address changing circumstances. Neither the permitting agency nor the facility owner or operator can anticipate all of the administrative, technical, or operational changes required over the permit term for a facility; therefore, permit modifications are inevitable.

Permitted facilities must request and receive approval for proposed procedural, mechanical, physical, and process changes that deviate from their approved permits. Such permit modifications can involve a significant level of effort on the part of the regulating authority including: discussions with the facility representatives to understand the change, class determination, technical review, regulatory analysis, comment, discussion, data entry, public notice, comment response, site visit to visually inspect the area being modified and document updates. Refer to Exhibit 5 for the main regulatory process steps and see Section I.C for a more comprehensive list of permit maintenance activities.

Permit Modifications Issued for each Change

Permit modifications and maintenance are critical for continued safe waste management. The prevention of dangerous releases also circumvents the need for new costly cleanups.

A. Continual Work for Protection of Human Health and the Environment

Permit writers continually work with facilities to ensure that sound operating procedures and proper waste management practices are being conducted in a way that is protective of human health and the environment. When changes to facility design and operations are proposed, permit writers assess the impacts, including the potential for releases of hazardous waste or hazardous constituents. Permit writers also make sure that permits reflect decisions that enable facility cleanup to effectively move forward. (See the case studies in Part 2 for specific examples.)

The permit establishes the administrative and technical conditions under which a facility must operate. The permitting authority's ongoing oversight of facility operations and interactions with the facility contacts are essential to ensuring the continual protectiveness of permit conditions. These activities are an important element of permit maintenance and can help both parties identify potential modifications that might be needed to support evolving waste management methods or other changing needs at the facility.

Permit maintenance prevents hazardous waste releases as operations change:

Initial permit conditions are established in order to ensure hazardous waste is safely managed and to prevent releases to the environment. As facility operations or other factors change through time, permitting authorities need to work with the facility to ensure that conditions outlined in the permit continue to prevent releases and require best waste management practices.

There are valid environmental reasons for formal approval of the facility changes in order to prevent release. For example, secondary containment not adjusted to allow for increases in quantity of hazardous waste managed could pose an increased risk of release, which in turn may result in human exposure and a lengthy and costly cleanup. The regulator must assess changes in order to ensure that they are appropriate and protective.

The RCRA Hazardous Waste Permitting Program

The Resource Conservation and Recovery Act (RCRA) provides the general requirements for EPA's waste management program. The RCRA hazardous waste permitting program, established under RCRA Subtitle C, ensures the safe treatment, storage, and disposal of hazardous waste by establishing administrative and technical requirements under which a hazardous waste management facility must operate.

Permits typically include conditions governing facility design and operation; safety standards; emergency plans; corrective action programs designed to respond to releases; financial assurance for unit closure and post-closure maintenance; and other required activities, such as employee training, monitoring, and reporting. The permitting process includes the issuance of initial permits, modifications, renewals, and termination.

Facilities that are required to obtain RCRA permits must request and receive approval for procedural, mechanical, physical, and process changes that deviate from their approved permits.

For more information about hazardous waste permitting, see http://www2.epa.gov/hwpermitting

B. Permit Modification Requests: Objectives and Outcomes

Permit modifications respond to various business needs by revising the permit to ensure that the changes are protective of human health and the environment. Changes to the facility operations and related permit modifications can have the effect of improving a facility's operational efficiency, economic development, as well as allowing for creative problem solving and other aspects such as facility management. Some modifications are initiated due to changing environmental requirements. (See the case studies in Part 2 for specific examples.)

Reasons for Permit Modification Requests

- **Operational efficiency:** Permit modifications allow for development and implementation of new technologies and systems while ensuring protective standards. These changes can improve the efficiency of facility operations, which lead to ancillary effects such as operational cost savings or environmental improvement. For example, by expanding its waste management capacity, a facility can reduce transportation costs and corresponding environmental impacts associated with off-site treatment or disposal. Other changes, such as the addition of new treatment technologies or redesign of storage areas, may lead to operational efficiencies at the facility.

- **Economic development:** Companies may request permit modifications in order to incorporate changes needed to grow and expand their business and waste management infrastructure. For example, permit modifications allow companies to install new units for treating or disposing of hazardous waste or to incorporate new waste management processes that allow companies to treat new waste streams. Timely permit modifications ensure that these changes maintain protection of human health and the environment while allowing companies to keep pace with changes in the marketplace and assure their competitiveness.

- **Environmental improvement:** Permit modifications can lead to environmental improvements in multiple ways. Many modifications facilitate cleanup of contaminated soil or groundwater, which reduces risks to human health and the environment. Other modifications allow facilities to increase the recycling or reuse of materials, thus reducing corresponding waste streams. Some changes are undertaken to improve technological or operational efficiency; these can have ancillary environmental benefits, such as reductions in fossil fuel use and greenhouse gas emissions. Permit modifications may also be triggered by changes to environmental regulations (e.g., new air quality standards may require removal of hazardous pollutants from stack emissions, creating a new waste stream that must be managed).

- **Other:** Permit modifications can also be made in response to general improvements in waste management. Common modifications that can improve waste management practices are updates to waste analysis plans or contingency plans for emergency response actions. Administrative changes, such as revisions to facility contact information, or changes to facility ownership are addressed through modifications.

The issues addressed by permit modifications range from minor administrative changes to significant physical changes at a facility.

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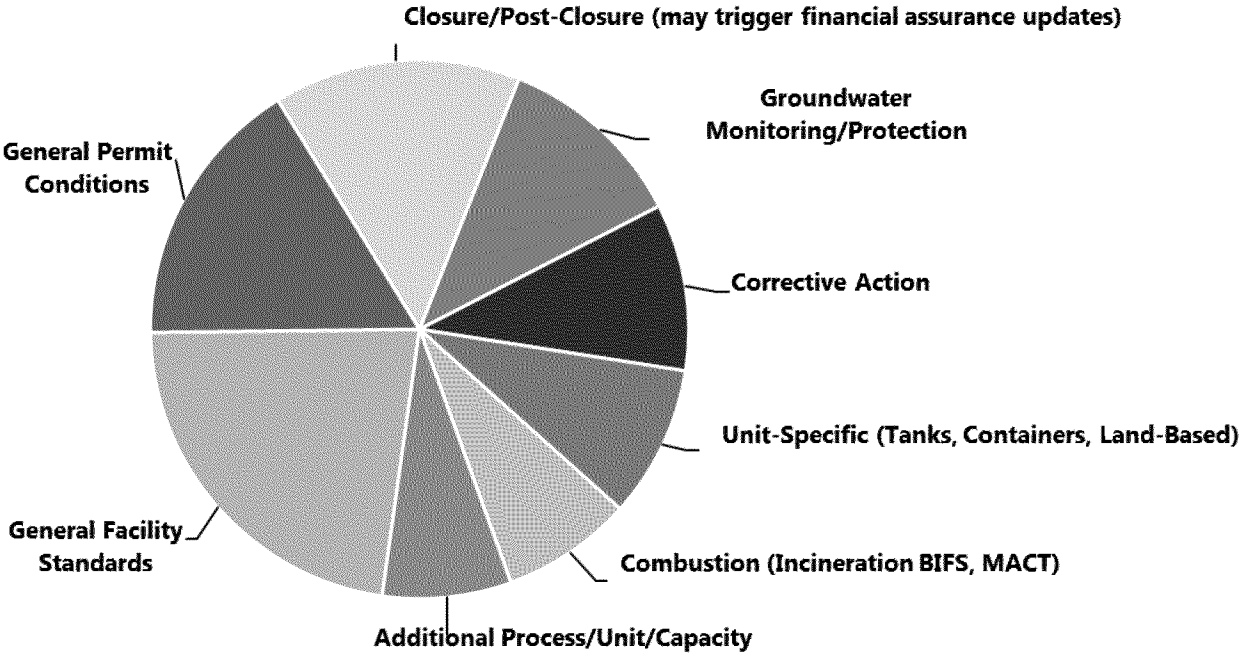
Exhibit 1 summarizes the distribution of permit modification approvals for 2011 through 2013. As shown in the graphic, changes to general facility standards, general permit conditions, closure/post-closure (which may trigger financial assurance updates[5]), groundwater monitoring/protection, and corrective action represented a large percentage of all permit modification approvals.[6] The modifications cover operating and post-closure permits. A growing number of modifications are for permits that have been continued in order to address facility-wide corrective action after the TSD units are clean closed. The case studies presented in Part 2 of this report describe the kinds of permit modifications in more detail.

Exhibit 1. General Distribution of Permit Modification Approvals by Type (2011-2013)



Note: EPA calculated this distribution using data from the RCRAInfo database where the modification type was identified in the code or the notes for "other modifications." This does not reflect data from all states. Modifications were not required to be tracked in RCRAInfo in this timeframe. (Sample size: 788 permit modifications out of 2479). See details about RCRAInfo Data in Appendix 2.

C. Permit Maintenance Activities

With the vast majority of the hazardous waste management facilities already permitted, permit maintenance, including modifications, account for most of the permitting workload. The maintenance of permits involves processing and approval of modifications, as well as other oversight activities, such as compliance inspections, responding to the public's calls and questions, and review of routine facility reports. Below are examples of permit maintenance activities that occur throughout the life of the permit.

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[5] Although changes to the closure and post-closure plan typically require updates to a facility's financial assurance, regular maintenance of a facility's financial assurance alone does not generally trigger a permit modification. Maintenance of financial assurance includes annual verification of the financial documents submitted by facilities to ensure the amount is adjusted for inflation and the mechanism is still valid and, when necessary, additional steps to ensure coverage remains in place (e.g., response to instrument provider cancellation requests).

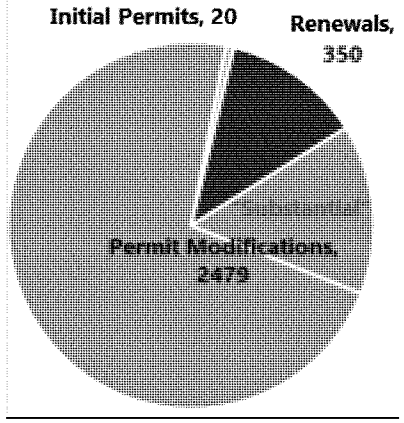
[6] This pie chart is intended to show the general ratio of activities involved in the various permit modification approvals, not specific amounts or percentages. The state data that could be relied on for this assessment is only 32% of the national total. It does not include data for all states, nor does it include approvals entered where the activity was not specified in the code type or in the notes. See Appendix 2 for additional details. State ratios vary considerably, for example, Texas has a larger percentage of combustion modifications.

Examples of Permit Maintenance:

- **Modification Activities**
  - Initial discussion with facility representative regarding details of planned facility changes and determination of modification class
  - Review/approval of modification requests and associated deliverables required under the regulations or schedules of compliance in the permit and conduct site visits
  - Conduct public participation activities, such as solicitation of public comment and public meetings or hearings (may be adjudicated)
  - Conduct environmental assessments
  - Compile environmental impact statements
  - Perform other required procedural activities, see the process outlined in Exhibit 5

- **Other Permit Oversight and Maintenance Activities**
  - Review/approval of documents and routine reports required under the regulations or schedules of compliance in the permit (e.g., semi-annual/annual groundwater monitoring reports)
  - Conduct compliance inspections
  - Review of facility demonstrations of financial assurance
  - Respond to citizen/media calls
  - Facility management planning
  - Data management
  - Respond to internal inquiries and file review requests
  - Permit billing (cost recovery) activities
  - Participate in meetings, phone calls, and site visits

Permit Modifications as compared to Initial Permits and Renewals 2011-2013



As the majority of facilities on the permitting track now have permits in place, the permitting workload is now shifting to modifications.

Relative Workload in 2011 thru 2013:

- There are about seven times more permit modifications than renewals.
- Permit modifications and renewals outnumber new issuances at a rate of 141 - 1.
- 1,429 facilities are permitted and appear to be in the workload for modifications and renewals.
- Generally, 17% of the modifications require "substantial" changes to the permit and these can be comparable to initial permit issuance or renewal with regard to complexity, workload, and public participation requirements.

See Section III.B for details on the data.

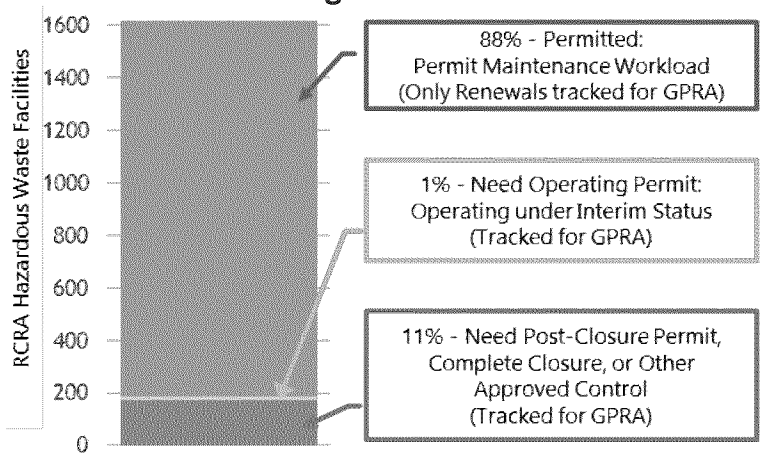
The modifications can trigger a great deal of unanticipated work. For example, the transfer of facility ownership is a Class 1 modification, usually the simplest modification to process, but it also involves changes in the financial assurance mechanisms (e.g., trust fund, insurance policy, or letter of credit), granting a release for previous owner, and other responsibilities in addition to the actual modifications to the permit. Other activities can require special technical expertise. Activities, such as environmental assessments and impact statements, could be done in concert with efforts to "green" the permit (see Part 2 Section B). In summary, permit maintenance work is more than just making specific edits to permit criteria; the permit review must assess the overall waste management practices of the facility in order to make sure the change in the permitted activity is in compliance with the regulations.

II. THE UNTOLD STORY

A. Why Modifications are an Untold Story

The first RCRA permit deadlines came with the 1984 Hazardous and Solid Waste Amendment (to RCRA) and issuing permits became a major goal for RCRA programs. For many years, EPA and authorized state agencies have continued to focus on the issuance of new and updated regulatory controls (primarily initial permits and permit renewals) as a core program performance measure. This national performance measure was largely an outgrowth of the Government Performance and Results Act (GPRA) of 1993, which mandated that federal agencies establish performance measures to gauge the success of their programs.

Exhibit 2. RCRA Permitting Workloads in 2015



Permitting Workloads in 2015

Permitted (88%)

1429 - The "Permit Maintenance Workload" contains the facilities that are permitted and are expected to need permit modifications and other maintenance. The facilities that would also eventually need permit renewals are included in this set. At the current rate of renewals, about 300 facilities (~21%) are administratively continued past their permit expiration date and need renewals. Renewals are tracked for GPRA.

Never Permitted; Tracked for GPRA and Need Initial Controls (12%)

16 – Need Operating Permit: Facilities have at least one unit that is "operating, actively managing RCRA hazardous waste" and is under interim status standards.

172 – Not Operating: Need post-closure permit, completion of closure obligations, or other approved controls in place. The majority of these facilities are on track for clean closure (and/or a corrective action order), but some will be issued post-closure permits.

Note: There are additional facilities that are not shown in the graph totals above and are less of a priority (not tracked for GPRA), but are still under the oversight of the permitting programs.

See Section III.C for the permit maintenance workload criteria and a comparison to other regulated facilities. See Appendix 2 for additional details on this information.

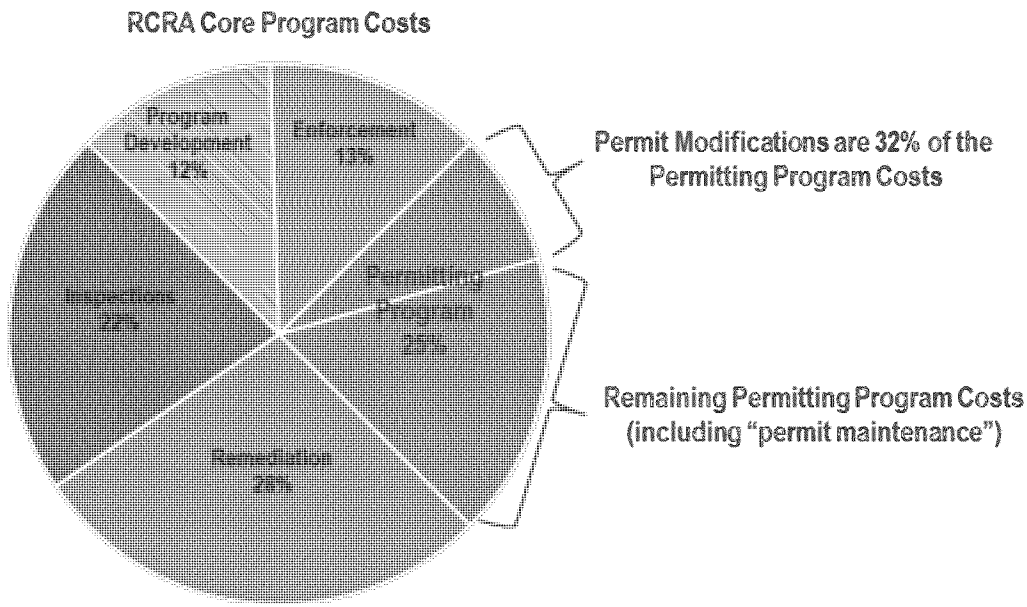
Today, RCRA permits have been issued to the vast majority of facilities in the GPRA workload, and many of those permits have been reissued. Exhibit 2 shows the current related permitting program workloads. EPA's RCRA program continues to establish national goals for initial controls (permit issuance, clean closure, or other controls in place) and renewals.

A primary purpose of RCRA permitting requirements is to ensure that ongoing hazardous waste management activities are protective and do not result in cleanup obligations; however, the preventive nature of the permitting program is difficult to track as a performance measure. Permitting and permit maintenance are nonetheless ongoing and effective tools in ensuring that hazardous wastes are not mismanaged. Whereas the Agency has been able to successfully track permit issuance and renewal since they are "predictable" tasks, permit modifications have not been included in core program performance measures or national goals for very practical reasons. The frequency, timing, and complexity of permit

modification requests in any given year is unpredictable, primarily because the majority of these requests are initiated by facilities.

The workload uncertainty keeps the program from projecting the number of modification approvals to be accomplished, but resources nonetheless have to be prioritized and in place in order to address them. Modifications represent a substantial workload for EPA and the authorized states and they should be considered along with the accomplishments tracked in the RCRA core programs. The Association of State and Territorial Solid Waste Management Official's (ASTSWMO's) State RCRA Subtitle C Core Hazardous Waste Program Implementation Costs Final Report, published in January 2007, discussed this in detail, emphasizing that an estimated 32 percent of costs to the state authorized hazardous waste permitting program can be attributed to permit modifications (see Exhibit 3). This does not include all permit maintenance activities. The ASTSWMO's report also states: "In terms of overall State RCRA Core C program costs, permit modifications represent the single most costly activity that States perform."[7]

Exhibit 3. Relative RCRA Program Costs to States in 2007



Since the 2007 report, more facilities have been issued an initial permit and the permit renewal backlog is diminishing, thus shifting more of the work towards maintenance (including modifications).

The proportion of State Core RCRA Subtitle C program workloads and associated costs devoted to permit modifications are now understood but, to date, there has been little discussion of the economic, environmental, and regulatory benefits of permit modifications and these are often not fully considered during annual planning and funding negotiations.

[7] ASTSWMO's full report is available at: http://www.astswmo.org/Files/Policies_and_Publications/Hazardous_Waste/Final%20Report%20-%20RCRA%20Subtitle%20C%20Core%20Project.pdf

B. Why an Efficient Permit Modification Process is Necessary

Speed of business has accelerated. The hazardous waste landscape has evolved considerably since the regulations were established in the early 1980s. Since then, personal computer use and electronic communications are ubiquitous, innovations in information technology have exploded, and the pace of globalization and trade has quickened. As business needs accelerate, EPA and the states have sought more efficient ways to review permit modifications in order to ensure permits remain protective of human health and the environment without encumbering business needs. Tools such as model permits, templates, regulatory guidance, and training allow regulatory authorities to issue hazardous waste modifications that are protective of the environment and responsive to business.

Urgent Changes. To stay competitive, owners and operators must respond faster to changes in their marketplace. They must be at the ready to implement changes that will reduce costs, expand infrastructure, and develop new markets. Timely permit modifications are critical for responding to these needs in a manner that is protective of human health and the environment while avoiding delays in time-critical decisions.

Permit modifications that enable businesses to implement changes to improve protectiveness, such as changes to increase recycling, minimize waste, and improve cleanup of sites are paramount to meeting the intent of RCRA. For example, the RCRA corrective action program has focused on increasing progress toward constructing cleanup remedies. Timely modification of a permit to incorporate a cleanup remedy decision contributes to more prompt reduction of current and future risks from contamination. It is vital that permit modifications are processed efficiently and effectively to avoid costs to the environment as well as to industry.

Federal and state regulators must carefully review permit modifications to ensure the action is in compliance with regulatory requirements and is protective of human health and the environment. Regulators must also provide adequate opportunity for the public to have a voice regarding decisions that potentially affect their community (i.e., a change in treatment may trigger a need for storage that the facility did not anticipate). When the regulatory agency is able to quickly shift priorities and resources, these activities can be implemented expeditiously, and thus better align with the facility's business-related schedules and deadlines, as well as bring environmental protections into place in a timely manner.

Permitting Resources Needed to Respond to the Shift: In the past, RCRA permitting programs have primarily focused on issuing permits, but with the majority of the hazardous waste management facilities already permitted, permit maintenance and modifications account for most of the permitting workload. In addition, businesses have come to expect timely attention and service to their permit-related applications, especially in light of the permitting fees they pay in many states, yet at the same time federal and state hazardous waste resources devoted to providing such service have diminished.

The first step in addressing these issues is bringing attention to the issue. This issue was first highlighted in ASTSWMO's 2007 RCRA Core Report. This 2007 Report provided an accounting of workloads in broad programmatic areas within the hazardous waste realm and clearly identified the resources devoted to new permit issuance/reissuance versus other permit related activities including permit modifications. One conclusion of this analysis was that there was (and continues to be) a major shift in program emphasis since the early 1980s to permit modifications/maintenance in permit-related areas. As a result of the shift, significant federal and state program resources have been diverted to work in these areas, which is supported by the statistics contained in the ASTSWMO report and this paper.

III. Permit Modifications: Status and Statistics

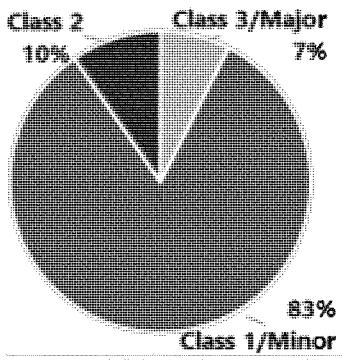
A. Permit Modification Process and Timeframes

The procedures for making changes to a permit will vary depending on whether the permitting authority or the permittee is initiating the change.

There are three basic situations that involve changes to a permit after issuance/reissuance:

- Permit modification at the request of the permittee (see 40 CFR 270.42, the most common)
  - Class 1, Class 2, and Class 3 described below
- Permit modification at the request of the State/EPA (see 40 CFR 270.41, this is very rare)
  - Modification of the permit
  - Revocation and reissuance of the permit
- Termination of the permit (see 40 CFR 270.43, not a "modification")

RCRA permit modifications are organized into three classes.[8, 9]



See Section III.B for details about the data.

Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operations. These changes do not substantially alter the conditions in the initial permit or reduce the facility's ability to protect human health and the environment. Some Class 1 modifications (such as a change in the emergency contacts) do not require prior approval by EPA or the authorized state-permitting agency. However, most changes require prior approval. Class 1's are typically the easiest to process. Most are simple changes to the permit, although some can be rather difficult to address, such as a change in ownership, which triggers financial assurance changes.

- **Expected Staff Time to Address: 2-25 hours** (100 hours or more for ownership changes especially with complex facilities that have multiple owners under one permit.)

Class 2 modifications address changes needed to maintain safety or regulatory compliance at the facility. In particular, Class 2 modifications apply when facility owners and operators need to respond to common variations in the types and quantities of waste managed by the facility, technological advancements, and new regulatory requirements, where those changes can be made without substantially changing the design specifications or management practices in the permit.

- **Expected Staff Time to Address: 41-119 hours** (up to 340 hours in rare cases)

Class 3 modifications are major changes that substantially alter the facility or its operations. For example, changes to waste management practices to accommodate new types of waste, substantial increases in storage capacity, or changes to the facility's groundwater monitoring program would require a Class 3 modification. Modifications in this classification have a wide range of complexity and typically include the more complicated permit changes.

- **Expected Staff Time to Address: 59-640 hours** (up to 1850 hours in rare cases)

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[8] Several states (AL, FL, ME, MN, NY, OH, and SC) use the original "major or minor" permit modification categories in lieu of the three class system introduced in a 1988 rule (53 FR 37912).

[9] The "Expected Staff Time" ranges come from the 2007 ASTSWMO Core report. See also background in Appendix 2.

Exhibit 4 provides examples of the types of changes covered by each modification classification.

Exhibit 4. Examples of Permit Modification Classifications

Class 1	Class 2	Class 3
Administrative and informational changes	Changes in frequency or content of inspection schedules	Creation of a new landfill as part of closure
Correction of typographical errors	Minor changes to corrective action	Addition of corrective action remedy
Changes in names, addresses, and phone numbers of emergency coordinators	Changes to facility training plan that affect the type or amount of employee training	Addition of compliance monitoring to groundwater monitoring program
Changes to comply with new regulations for analytical quality control plans, or waste sampling and analysis methods	Changes in number, location, depth, or design of groundwater monitoring wells	Addition of temporary incinerator for closure activities
Note: Permit modifications are classified in more detail in 40 CFR 270.42, Appendix I, which is described in "Modification Types Based on Regulatory Descriptions" in Appendix 1 of this report.		

The process for modifying a permit differs depending on the classification of the modification. For Class 2 and Class 3 modifications, the modification process follows a series of defined steps similar to the initial permit application process. In contrast, the administrative requirements for Class 1 modifications are comparatively minor. Class 2 and Class 3 modifications require the facility to follow several steps to encourage public participation. These steps include publishing a notice of the request for permit modification in a public newspaper; holding a public meeting; and allowing a 60-day public comment period on the requested modification. Exhibit 4 illustrates the modification process for all three Classes.

Typical timeframes for completion of modifications are based on the time needed for public comment, complexity of the modification request, class type, and availability of agency staff resources. The permitting agency may need additional information from the facility in order to make a decision and these interactions can be lengthy. Denials are relatively rare since provisions allow for revisions and extensions. The permitting agency may also determine that the class should be higher or lower (or deciding if a Class 1 needs prior approval) based on the change being made.

Agency-initiated modifications generally require a similar process to issuing a full permit (these are not as common as facility initiated modifications).

Temporary authorizations, as described in 40 CFR 270.42(e), can be requested for the following objectives:

- Facilitate timely implementation of closure or corrective action
- Prevent disruption of ongoing waste management activities
- Respond to sudden changes in the types or quantities of waste managed
- Allow specific treatment or storage in order to comply with land disposal restrictions
- Facilitate other changes to protect human health and the environment

Temporary authorizations allow the changes to a permitted activity to take affect sooner than the regular modification process allows. If the changed activity must continue after expiration of the temporary authorization, a regular modification process would still be required. Temporary authorizations are allowed for modifications that would normally be included in a Class 2 or 3 modification request. A creation of a temporary storage unit to store hazardous waste prior to treatment or disposal would be an example of a situation where the use of a temporary authorization would be appropriate.

Public input can also help permittees or prospective applicants make better decisions during the process. Public interest tends to be high for facilities receiving their initial permit and may decline over the lifespan of a permit, particularly at facilities that have modified their permit many times (sometimes over 100 changes). Effective and meaningful public participation remains critical for informing decisions made by the facility managers as well as the regulating agency.

See Exhibit 5 for the regulatory public participation requirements based on the permit modification class. The main required components of public participation for permit modifications are:

- Notification of the facility's modification request sent to mailing list;
- Publication in local paper and modification request made available to public (Class 2 and 3);
- 60-day public comment period for the facility's modification request (Class 2 and Class 3);
- Public meeting hosted by the facility (Class 2 and Class 3);
- Notification of the decision;
- 45-day public comment on the draft permit conditions (Class 3); and
- Public hearing (if requested for Class 3).

In many cases, expanded public participation efforts (such as use of modern technology) are recommended.[10] For example, greater outreach may be needed for modifications that involve potential off-site impacts, such as air emissions or cleanup of releases that have migrated off-site. Additionally, greater outreach may be warranted to more effectively support communities when the facility is located near disadvantaged areas or when facilities are clustered and thus may add to cumulative potential impacts at adjacent communities.

Staff time needed to address permit modifications can vary greatly. A simple modification can take as little as several hours to administer and approve, while more complex modifications may take up to 1,850 staff hours to assess and approve.[11] Exhibit 5 demonstrates the steps involved in reviewing and approving each class of modification request.

EPA regulations specify that Class 2 modifications generally are to be concluded within 3-4 months. By contrast, EPA regulations do not specify a deadline for completion of Class 3 modifications. Class 3's tend to take more time due to the complexity of the issues in addition to the 105 days total of public review.

Case-Specific Issues

In addition to the process steps involved in reviewing permit modifications, other factors can greatly add to the processing time:

- Unanticipated communication between the state and the facility due to incomplete applications.
- Additional activities needed in order to follow the prescribed regulatory steps such as a monthly follow-up with required monitoring reports.
- Complexities, such as those resulting from change of ownership and parceling of property.
- Assessment as to which class of permit modification is appropriate.
- Multiple modifications in different phases of the process for the same facility.

Please see the case studies in Part 2, which help illustrate these issues.

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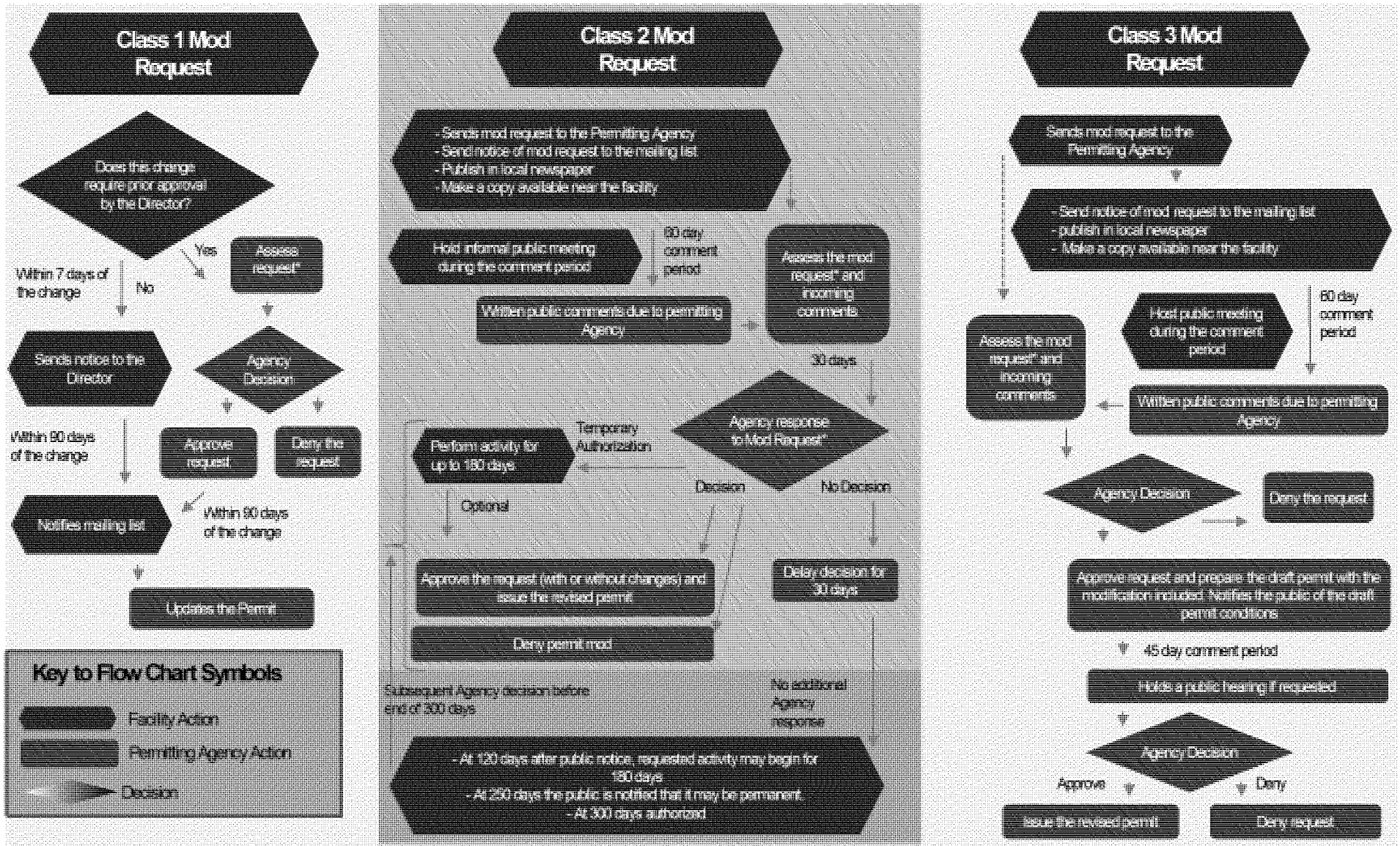
[10] EPA is currently updating the 1996 RCRA Public Participation Manual, which will provide further guidance regarding expanded public participation. See the website (http://www2.epa.gov/hwpermitting) for the current manual and the one to be revised.

[11] The high end of the staff time it can take to address permit modifications (1,850 hours) is from Appendix I of the 2007 ASTSWMO Core report (under "Estimation of Work Hours" page 39).

Exhibit 5. Permit Modification (Mod) Process for each Class

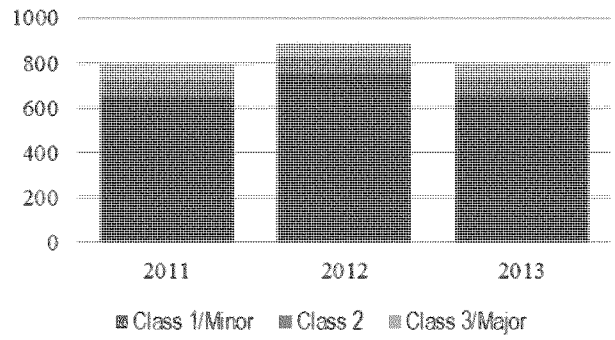


See 40 CFR 270.42 for the full federal regulations for permitted mod requests. State regulations may vary. Several states have not adopted the regulations for the three class structure, and use the preexisting Major and Minor Mod structure.
* The permitting Agency may need additional information from the facility in order to make a decision and these interactions can be lengthy. The Permitting Agency may also determine that the class should be higher or lower (or decide if a Class 1 needs prior approval) based on the change being made. The separate temporary authorization process can be used for Class 2 or 3 as appropriate (although not referenced in the Class 3 process above).

B. Permit Modification Statistics

This section describes the quantity of permit modification approvals granted during 2011 through 2013 and relates it to additional permitting information.

Exhibit 6. Total Permit Modification Approvals 2011 through 2013



From 2011 through 2013, regulatory officials approved 2,479 permit modifications. On average, 826 permit modifications were approved each year over the three-year period. Annual breakdown: 794 permit modifications were approved in 2011; 888 in 2012; and 797 in 2013. This data set does not count permit modifications that were still being assessed at the end of the year and does not count those that were denied or withdrawn. Exhibit 6 shows the relative number by type of these approvals by class and year.

According to a review of a smaller subset of the states that regularly track approvals in EPA's national database, the 2011 through 2013 tallies appear to be a little lower than the average rate. The decrease in number of modification approvals during the 2011-2013 period may coincide with nationwide economic factors, which influenced the need for changes and permit reissuances at permitted facilities.

Data used in the analysis. The permitting programs for each state record the permit modifications that are approved annually.[12] EPA collected these permit modification data for years 2011 through 2013 from state and regional sources for 39 states, the District of Columbia, and three U.S. territories. EPA obtained data for an additional eight states[13] and Puerto Rico from the Agency's national database when it was identified as the best and most accurate resource. Data for the remaining states (Maryland, New Jersey, and Pennsylvania) were statistically extrapolated based on permitting data.[14] Although there may be gaps in the data due to differences in tracking practices, and underreporting of Class 1 permit modifications, EPA considers these data to be the best available nationally.

Class 1 (or Minor) permit modifications were the most common, representing 83 percent of all approved permit modifications. Class 1 modifications are generally the least substantial type of modification. However, as previously described, in some cases they can be complex and lengthy to process.

Class 2 modifications accounted for approximately 10 percent of total permit modification approvals.

Class 3 modifications impose the greatest burden on regulators and permittees, but account for a significantly smaller percentage (7 percent) of total permit modification approvals. See Exhibit 7 for the

[12] Per 40 CFR 270.42(i), each environmental program Director must maintain a list of all approved modifications and must publish a notice once a year in a state-wide newspaper that the updated list is available for review.

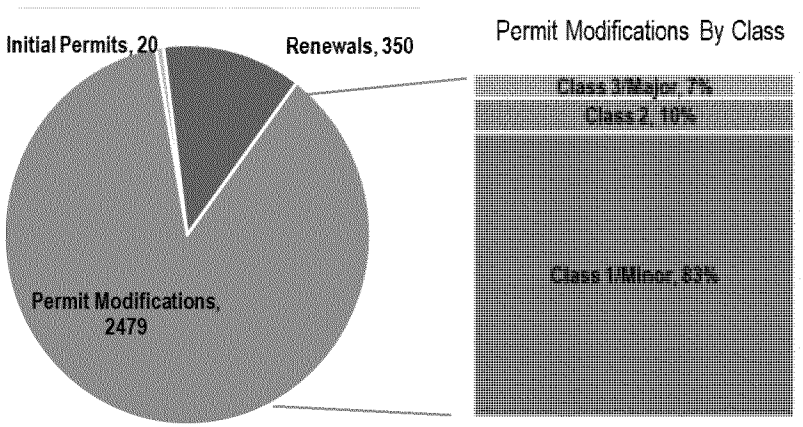
[13] EPA used RCRAInfo data for the following states: Alabama, Colorado, Georgia, Illinois, Indiana, Nebraska, New York, and South Carolina. Additional states use RCRAInfo to track modifications, but they provided tallies.

[14] Estimates of permit modifications in Maryland, New Jersey, and Pennsylvania were extrapolated based on the national average of permit modifications per permitted facilities. See Appendix 2 for additional details.

distribution of permit modifications by class and for the relationship to permit issuance.[15] Note that this does not include all permit maintenance activities.

Several states (Alabama, Florida, Maine, Minnesota, New York, Ohio, and South Carolina) use the original "major or minor" permit modification categories in lieu of the three class system introduced in a 1988 rule (53 FR 37912). Minor modifications were counted as Class 1's and major modification were counted as Class 3's for the national tally.

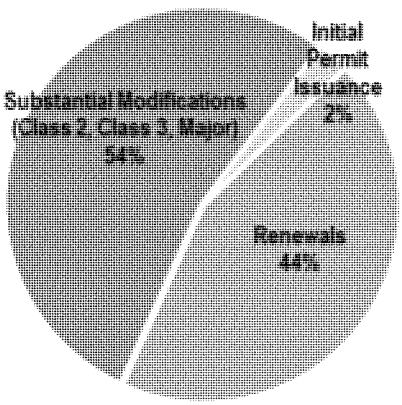
Exhibit 7. Permitting Actions 2011 Through 2013



Permits have different conditions for facilities that are operating or are in post-closure. Permit modifications can make changes for operating or post-closure standards, but there are typically fewer changes needed for facilities that are in post-closure.

The data also show that the number of permit modifications varies by state. On average, 17 permit modifications were approved per state/territory per year between 2011 and 2013.[16] However, the distribution around this average is wide.

Exhibit 8. Substantial Permit Actions



Permit modifications impose a substantial burden on regulators and permittees relative to permit issuance. The initial permits and reissuances/renewals in 2011 through 2013 were calculated from RCRAInfo data. The data shows that there are far more modifications than permit issuances during this timeframe.

Class 3 modifications (7%) are comparable to initial permit issuance or renewal with regard to public participation requirements. Similarly, some of the substantial (Class 2, 3, Major) permit modifications (17%) can be comparable to permit issuance with regard to the complexity and workload. See Exhibit 8 for the percent of substantial modification approvals (Class 2, 3, Major), initial permits issuance, and permit renewals.

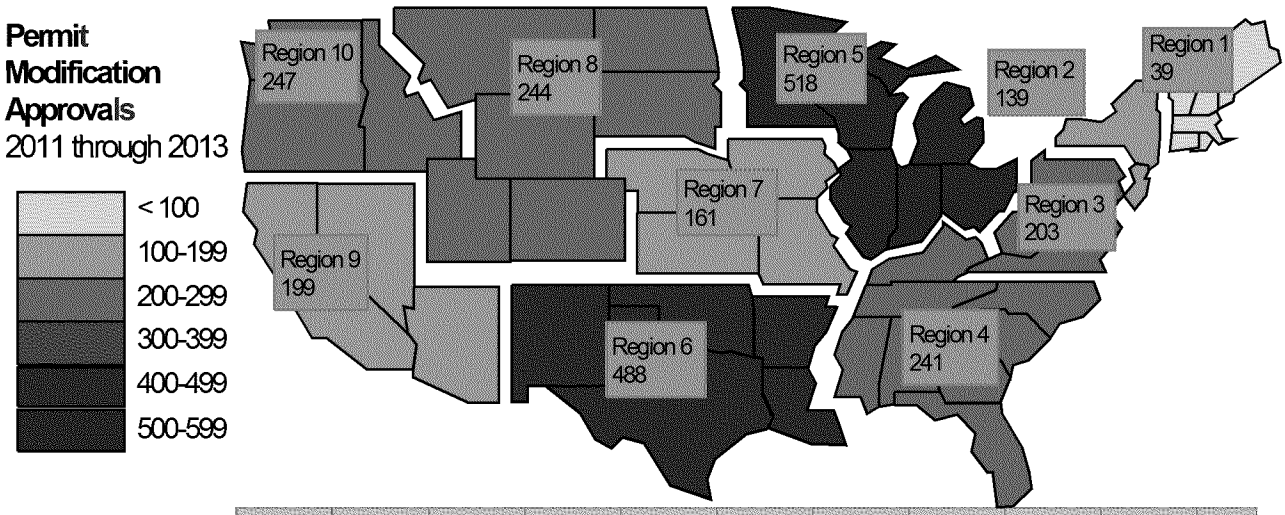
See Appendix 2 for additional details and background information about RCRAInfo and the data.

[15] EPA identified initial permits from RCRAInfo data for the permit determinations that occurred during 2011 through 2013 at a facility with no prior permit determination. The renewals are calculated from the permit issuances 2011 through 2013 that followed an initial permit issuance (prior to 2011).

[16] The calculation of this number does not include data from the District of Columbia, U.S. territories, or any state with no modifications recorded during that timeframe.

Many factors contribute to the differences in modification numbers among states. For example, some states have five-year permit terms versus ten-year permit terms. There is a greater likelihood that the major changes will be incorporated in the permit reissuance if a permit is reissued at shorter intervals (as compared to ten-year intervals). Permit fees on modifications can also sway business decisions regarding permit modifications (for example, the facility operators may delay changes that trigger permit modifications until the permit is renewed). States with more permitted facilities would be expected to have more modifications, but not all permitted facilities modify their permits at the same rate (for example, permitted facilities in post-closure care typically have fewer modifications on average). Exhibit 9 shows the number of permit modifications by EPA region.[17]

Exhibit 9. Permit Modification Approvals by Region (2011-2013)



	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10	Total
Number of Modifications 2011-2013	39	139	203	241	518	488	161	244	199	247	2479
Permitted Facilities	54	97	134	365	195	262	86	58	134	44	1429
Modifications per Permitted Facilities 2011-2013	0.7	1.4	1.5	0.7	2.7	1.9	1.9	4.2	1.5	5.6	1.7
Annual Modifications Per Permitted Facilities	0.2	0.5	0.5	0.2	0.9	0.6	0.6	1.4	0.5	1.9	0.6

1,429 facilities were permitted as of February 6, 2014. Either the included facilities had an operating permit or post-closure permit (or units with both) based on their specified legal status codes. Facilities were omitted if their operating status codes indicated they would not be eligible for a permit modification. See the criteria in Section III.C.

There is a large range of annual permit modifications at individual facilities. Many states had average numbers of modifications per facility well above or below the national averages. In some cases, a facility may require multiple modifications in a single year; conversely some facilities may tend to save their changes and integrate when the permit is renewed.

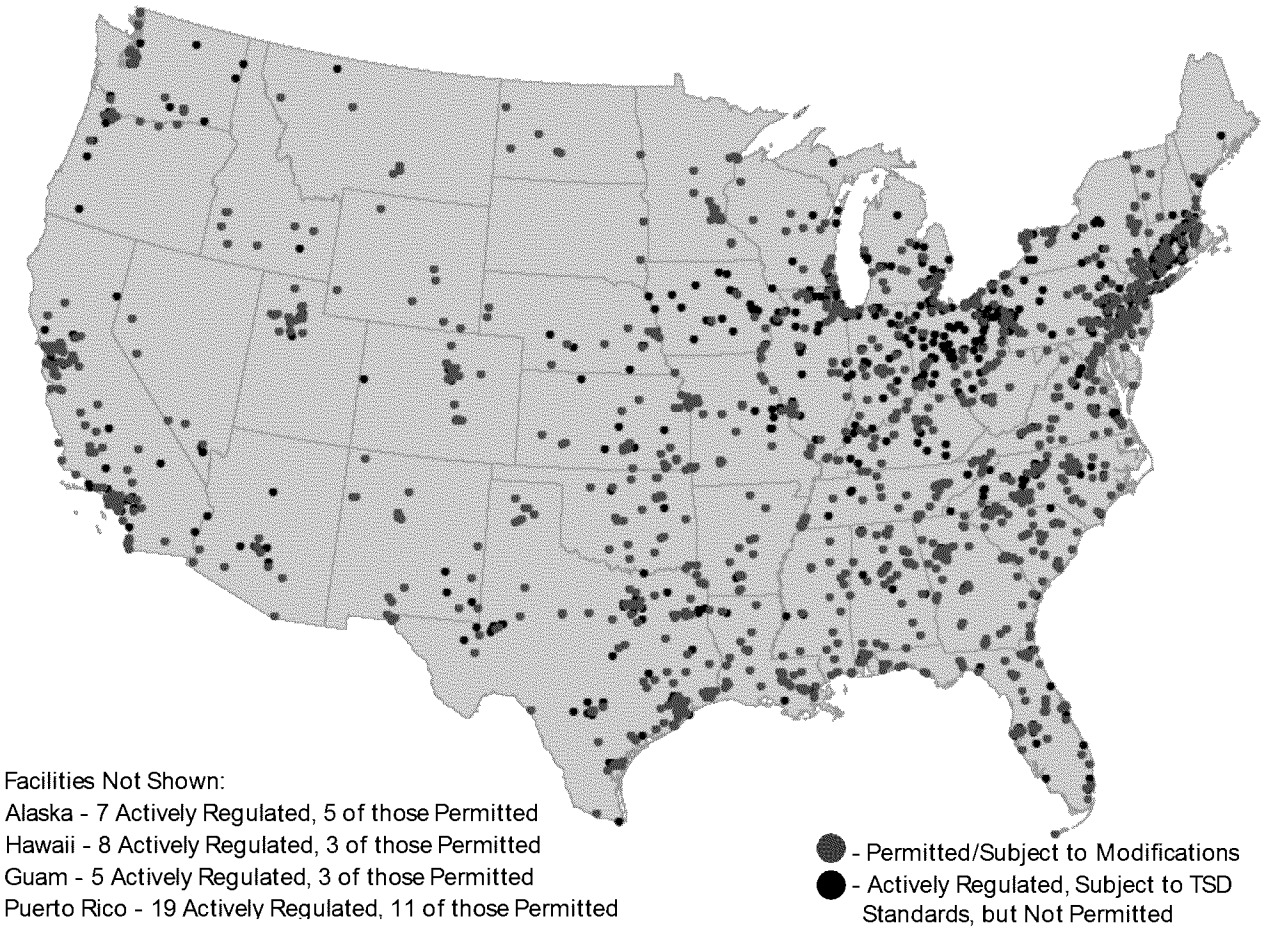
[17] States with fewer permitted facilities may experience more variation in the number of permit modification approvals per year. This represents an additional limitation of the three-year sample of data collected from RCRAInfo.

C. Location of Permitted Facilities with Potential for Modifications

The majority of the "actively regulated" hazardous waste treatment, storage and disposal (TSD) facilities have been permitted.

Exhibit 10 maps the universe of actively regulated TSD facilities. All of the facilities identified below (red and black dots) are subject to the regulations for standards for owners and operators of hazardous waste treatment storage, and disposal facilities and are described in more detail in Appendix 2. The red dots identify facilities that are permitted. Thus, the map shows 1,429 permitted facilities that are expected to eventually need permit maintenance/modifications (this number is calculated for the purposes of this report).[18] The black dots identify actively regulated facilities that are not permitted, such as facilities that are going through closure, but are not yet clean closed.

Exhibit 10. Facilities Permitted and Subject to Modifications, Versus Other Regulated Facilities



[18] According to RCRAInfo, 1,429 facilities (6,245 units) have at least one unit that is permitted (according to the legal status code and not terminated) and does not include facilities where all units are also coded as clean-closed, referred to CERCLA, completed post-closure care, or are coded as conducting activities that do not require a permit (according to operating status codes). If the facilities with those operating statuses were not removed from the count, this would add 400 additional permitted facilities (although generally not active, these permits may require some permit maintenance). Legal and operating status code data as of 10-30-14.

IV. Concluding Points

As the majority of facilities that are treating, storing, or disposing of hazardous waste have been issued initial permits under RCRA, the bulk of permitting activity has now shifted towards maintenance of those permits. Permitting activity is now geared towards responding to business needs and changes in facility operations while ensuring that the permitted conditions continue to be protective and prevent release. It is critical to keep up with the permit modification workload in order to enable improved business operations, technological upgrades, and expansions while maintaining protection of the environment.

Because RCRA permit modifications are not tracked as part of the Agency's Strategic Plan, this substantial and vital work has gone largely unrecognized. This report thus depicts for the first time the national perspective of permit modification work conducted throughout the country. The unpredictable nature of permit modification complexity, frequency, and timing makes workload balancing and resource allocation difficult to manage. While the workload for the number of modification requests cannot be projected accurately for set goals, the workload is now being recognized in other ways. EPA believes that improved characterization and quantification of permit modifications will enable greater understanding of the importance of effective RCRA programs for EPA, the state agencies, the regulated community, and the public.

In addition, better data and understanding of the permit modification work may uncover barriers, issues, and opportunities for improvement in the permit modification process. EPA remains open to learning how the RCRA permit modification process could be made more efficient and protective.

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PART 2
PERMIT MODIFICATION CASE STUDIES

While ensuring protection of human health and the environment is the underlying objective for the permitting standards, there are often business reasons – as well as environmental reasons – that compel companies to request changes to their permits. The following case studies describe real-world examples for the types of changes at facilities that require permit modifications across the country. They also offer a glimpse of the content and process for different permit modifications, while illustrating how changes to permits continue to ensure that proper safeguards remain in place and allow companies to respond to changing business needs or pursue innovative approaches to responsible hazardous waste management.

Permit modifications vary greatly in terms of purpose and complexity. The permit modification case studies are sorted into four broad categories of changes based on their primary outcome: A. Responding to Changing Business Practices or Operations Responding to Business Needs; B. Improving Hazardous Waste Management; C. Ensuring Long-Term Protection; and D. Keeping Permits Up to Date. The table below shows an index for the case studies and their main outcomes. The following sections describe each case study category in more detail.

The examples show a broad range of permit modifications, from very significant actions to reoccurring administrative updates.

Overview of the Permit Modification Case Studies in these Sections

INDEX: Case Study Categories
A. Responding to Changing Business Practices or Operations
1. Improvements in Technological Efficiency
2. Economic Development and New Waste Handling Capacity
3. Ownership Changes
B. Improving Hazardous Waste Management
1. Resource Conservation
2. Reduced Risk of Release and Improved Safety
3. Replacement of Damaged or Aging Equipment
C. Ensuring Long-Term Protection
Closure, Post-Closure Care and Corrective Action
D. Keeping Permits Up to Date
1. Emergency Response
2. Updates to Permit Standards and Conditions
3. Administrative Updates
E. Modifications over the "Life of a Permit"

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A. Responding to Changing Business Practices or Operations

INDEX A. Responding to Changing Business Practices or Operations
Case Study Categories
1. Improvements in Technological Efficiency
2. Economic Development and New Waste Handling Capacity
3. Ownership Changes

One common impetus for permit modifications is in response to facilities that want to make changes in their operations due to shifts in the market or other business-related factors. They may plan to adopt more efficient or less costly waste handling procedures, install new technologies, construct new units, change the manufacturing process that results in different wastes managed, use alternate fuel sources, or sell the facility.

As with any permit modifications, it is the role of the permitting authority to assure that such changes will be protective of human health and the environment.

Facilities often request these modifications to increase operational efficiency and compliance with permit requirements by adapting to changing conditions and needs. For instance, a permitted remedial system may become less effective over time necessitating a modification of the permit to allow for an improved remedial system. In some cases, remedial systems may be implemented in the midst of a busy production facility and have to allow for compatibility with production operations while maintaining remedial effectiveness.

Replacement of a M[illegible] wall System with a Barrier Wall

The Axiall Corporation in Lake Charles, Louisiana requested a Class 2 permit modification for the construction of a barrier wall to control horizontal migration of constituents of concern in groundwater into Bayou Verdine, Slip, and the Coon Island Reach to below levels that would [illegible] surface water to pose an unacceptable risk. This replaces a monitoring [illegible] shallow withdrawal system while Axiall continues to operate a Lower Aquifer Containment System. The system will control laterally migrating groundwater until the flow reaches a depth at which it is fully captured by the walls of the Lower Aquitard Containment System. Many technical concerns were raised by the public and were addressed during the modification process. The Louisiana Department of Environmental Quality concluded that the barrier would effectively control the groundwater flow from the facility to the adjacent water body than the groundwater withdrawal system that was [illegible]

Outcomes: After the replacement, the overall system will more effectively contain the constituents and remove contaminated groundwater at the Lake Charles Chemical Complex in Louisiana. The barrier wall will require [illegible] maintenance and operational effort resulting in increased [illegible] resources will be needed to implement this remedy and it will provide [illegible] environmental protection of the surrounding water body for long-[illegible] The public comment process resulted in resolution of certain technical concerns with the approach prior to implementation.

Associated Workload:

- Review/approval of the change request, design plans, construction [illegible] operating and maintenance plan, and annual corrective action reports
- Official public review and comment, and response to comments

A.1. Improvements in Technological Efficiency

After facilities are permitted, they often need to make changes to their waste handling practices in order to stay competitive and to adjust to market demands. In order to make these changes, facilities often need to modify their permits.

Most permitted facilities originally identified their types of equipment and units used to manage hazardous waste in their permit applications in the 1980s. Some of the equipment and processes may now be outdated. Multitudes of technological advances have occurred since the 1980s that can produce environmental benefits (as well as cost savings to the facility).

A number of advances have also been made in the methods to address contamination. See the highlighted Axiall Corp case study for an example of the use of a new barrier wall to control lateral migration. This case study, like many others, also applies to other categories. The changes at Axiall Corp also ensure long-term environmental protection after operations cease (covered in Section C).

New equipment for more efficient waste management

A Clean Harbors facility in North Carolina received temporary authorization (while pursuing a Class 3 permit modification) from the North Carolina Department of Environment and Natural Resources for the installation of a shredder to help separate containers and liquid waste more efficiently, which would in turn offer improved environmental protections. Initially, Clean Harbors requested guidance on installing a new shredder for processing small containers to speed up separation of the liquids and containers in order to improve their waste management practices. The permit writer looked for guidance, consulted counterparts, and found previous EPA determinations that using a shredder was considered treatment in a "miscellaneous unit." The permit writer discussed this with the facility and advised them to submit a permit modification request and to consider the temporary authorization (TA) option for Class 3 modifications. Under 40 CFR 270.42(e)(3)(ii)(E), an allowable objective for issuing a TA is to facilitate changes to protect human health and the environment. The TA request was received, reviewed, and approved. The facility also submitted a permit modification request to add the shredder unit to its hazardous waste management permit.

The shredder unit was installed under the TA. The permit writer and Resident Inspector coordinated a site visit to view the process area and testing of the shredder unit with non-hazardous materials. The permit writer reviewed the requested changes in the permit modification application and requested some clarifications and corrections. Final revisions were submitted by the facility and the permit writer drafted revisions to the permit. The draft permit modification was issued for public comment and a public hearing was held during the 45-day comment period. No comments were received and the final permit modification was issued.

Although the TA process was streamlined relative to the typical Class 3 permit modification process, TA's still require substantial time and effort on the part of the facility and the regulatory agency responsible for review and approval.

Outcomes:

- The facility reduced operating costs with a more efficient process of separating waste from the containers.
- The TA process allowed for quicker implementation of the proposed modification.
- Coordination and technical expertise from the state permitting authority helped the facility

understand how the TA and modification processes could support the facility's desire to improve its waste management practices in a timely manner while ensuring that the new technique would continue to be protective of human health and the environment.

Associated Workload:

- Review/approval of the TA and the modification request. (No comments received).
- Repeated discussions with the facility about the appropriate calculations and appropriate type of modification.
- Public notice and preparation for/participation in public hearing.

Alternative fuel for a cement kiln calciner

Lone Star Industries, Inc. in Cape Girardeau, Missouri, manufactures Portland cement, the active ingredient in concrete. The facility requested a Class 3 permit modification from the Missouri Department of Natural Resources for a new technological solution that would allow it to replace a fossil fuel (coal) with an alternate (hazardous waste) fuel in the facility's calciner, aka indirect kiln. As part of the permit modification process, Lone Star first had to demonstrate the ability of the hazardous waste fuel to meet air emissions standards. The modification request also included updates to the facility's waste codes and a proposal to add two additional railcars and associated storage tanks. This modification enhances Lone Star's ability to meet changing market demands.

The changes at Lone Star also result in resource conservation, which is covered in Section "B. Improving Hazardous Waste Management."

Outcomes:

The use of alternate (hazardous waste) fuel in the calciner:

- Reduced long-term facility operating costs with better technological solutions.
- Reduced the amount of hazardous waste that might otherwise be disposed of in favor of beneficial reuse for energy recovery.
- Conserved and reduced the use of fossil fuels (coal).
- Reduced air emissions as the hazardous waste fuels burn "cleaner" than fossil fuels.

Associated Workload:

- Planning and oversight of demonstration test(s) to prove ability to meet emission standards.
- Review/approval of the modification request.
- Assess any comments from the 60 day public comment period on the request, and the 45-day comment on the draft revised permit and public hearing.

A.2. Economic Development and New Waste Handling Capacity

Modification requests by facilities are often in reaction to market changes (i.e., increase/decrease in generation of hazardous wastes or new state/federal hazardous waste). For example, facilities may need additional waste handling capacity, need to treat additional wastes types, need additional units to treat, store, or dispose of wastes, or have other needs in order to meet changing market demands.

Addition of Three New Hazardous Wastes

The Buick Resource Recycling facility requested a permit modification from the Missouri Department of Natural Resources (DNR) to allow for the construction, operation, closure, and post-closure of a new onsite Subtitle C landfill and two additional hazardous waste containment buildings. This modification was amongst 22 permit modifications that were processed from 2007-2013 as listed on the DNR website: http://dnr.mo.gov/env/hwp/permit/

The Buick Resource Recycling Facility receives lead-acid batteries and other lead-bearing wastes. The wastes are recycled to recover lead and other trace metals. In addition, the facility recycles sulfuric acid from the batteries and the plastic from the battery cases. Prior to the modification, the facility was comprised of two container storage areas, six miscellaneous treatment units, and five containment buildings. Slag generated from the secondary smelting process was previously treated in the facility to meet land disposal restrictions treatment standards and then hauled off-site to a RCRA Subtitle D (solid waste) landfill disposal. The contiguous facility property is subject to corrective action. The facility's rotary smelter and other furnace are currently certified for Missouri resource recovery.

Following approval of the Class 3 Permit modification, the new on-site landfill cells were constructed to RCRA Subtitle C (hazardous waste) standards and put into operation to manage secondary smelting slag and gypsum wastes generated on the facility. These standards included a double liner system, leachate detection/collection systems, a groundwater detection monitoring program, and financial assurance for closure and post-closure care of the landfill.

Outcomes:

- Improved long-term economics and reduced operating costs from the new on-site waste storage/disposal capacity (metals recycling process contained on-site, possible future slag reclamation, cost saving for on-site disposal).
- Reduced potential for off-site contamination by eliminating about 98% of waste leaving the site thus reducing spill associated with off-site transportation.
- Improved traffic safety and reduced fossil fuel use/air emissions (about 130,000 gallon reduction in diesel fuel use annually) by having 2,500 fewer trucks leaving the facility on an annual basis.
- On-site management of wastes in compliance with RCRA Subtitle C (hazardous waste) requirements as opposed to previous on-site treatment and transportation on public roads to off-site disposal at RCRA Subtitle D (solid waste) resulting in enhanced environmental protection and future liability protection for the Permittee.

Expansion of facility operations without using new green space

The CHS Inc. Laurel Refinery in Laurel, Montana, submitted a request for a Class 2 permit modification to the Montana Department of Environmental Quality (DEQ) to allow closure of a land treatment unit using risk-based closure standards for soil and groundwater. The facility was able to close the unit and reuse the eight-acre area for structures associated with new Coker and Coker Flare units. Restrictions preventing residential use of the area were placed on the property deed.

The facility worked closely with DEQ to expedite the assessment and construction of the new units. Communication between DEQ and CHS was essential to ensure refinery planning needs and all regulatory requirements were met. Timely reviews of documents submitted in support of the modification request, issuance of an environmental assessment, and DEQ's final decision on the request were critical for planning and final implementation of the refinery expansion.

Outcomes:

- CHS expanded its refinery operations using the footprint of the land treatment unit by demonstrating concentrations of hazardous constituents in soil and groundwater met risk-based standards.
- Use of conservative risk-based closure standards and restrictive land use controls can allow for appropriate reuse that is protective of human health and the environment.

Associated Workload:

- Technical review and approval of documents supporting the modification request, closure plan, and closure report and certification for the land treatment unit.
- Development and issuance of environmental assessment for public comment.
- Issuance of final modification determination after consideration of all public comment.

New refinery process unit

Phillips 66 Company had a need for a new refinery process unit. They submitted a Class 3 permit modification request to the Montana Department of Environmental Quality (DEQ) for removal of an asphalt cap on a closed surface impoundment at the Phillips 66 Billings Refinery in Billings, Montana, in order to install a new refinery process unit at that location. Removal of the cap was necessary for remediation and removal of contaminated soil and hazardous waste. All wastes and contaminated vadose zone soils were removed, allowing use of the space for a new refinery process unit. Removal of the contaminated soil and waste reduced the risk of future contaminant exposure to industrial workers and potential leaching of hazardous constituents to groundwater.

Outcomes:

- The subject area was remediated and was able to be reused.
- Environmental protection was enhanced.

Expansion of treatment capacity for mixed waste

The Perma-Fix Northwest facility in Richland, Washington, requested a Class 3 permit modification from the Washington State Department of Ecology to expand treatment capacity for mixed waste (a waste that contains a hazardous waste component and a radioactive material component) and to install a new evaporation system. The permit modification was to allow for the following: the installation of two new evaporator units, increased tank storage capacity, and storage of mixed waste in tanker trucks. It also clarified language to align the permit with current practices. Further processes would stabilize residue. An older gasification/vitrification system was also to be replaced via the permit modification.

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Outcomes:

- The installation of new units and changes in waste handling procedures would have allowed the facility, which provides industrial and nuclear-waste management services, to expand its ability to treat and manage mixed wastes, but this specific upgrade was no longer pursued after the facility was informed of additional assessments needed. The upgrades need to be able to show that they continue to be protective (i.e., demonstrate the effectiveness for treating the wastewater streams).

Associated Workload:

- A great deal of assessment goes into modifications that are not eventually approved. Technical review of documents supporting the modification request led to a determination that the request was incomplete and a notice of incompleteness was issued to Perma-Fix Northwest. The modification was missing a thermal risk assessment work plan, demonstration test, and information on the proposed wastewater streams proposed to be treated in the evaporation systems.
- Perma-Fix requested that the permit modification be rescinded after the letter of incompleteness was issued.

A.3. Ownership Changes

Permitted facilities are often purchased by or merged with other companies. This tends to lead to requests for "urgent" permit modifications for changes of ownership and/or operational control of the facility. In order to ensure that the environment continues to be protected after an ownership or operational control transfer, the permitting agency must ensure that the new owner or operator provides financial assurance in a timely manner and that the amount of financial assurance is sufficient to cover future closure or post-closure at the facility. This is essential for long-term environmental protection.

As mentioned in the accompanying case study below, many facilities have difficulty in following the regulatory requirements and time frames to notify the permitting authorities regarding the planned ownership transfers and to have financial assurance. This makes it difficult for permitting authorities to process the information and ensure that the new facility owner or operator is compliant with the applicable regulatory requirements including those related to financial assurance. Permit modifications for changes of ownership or operational control can be relatively straightforward; however, this type of modification can become complicated and lengthy, particularly as compared to other Class 1 type of modifications. Substantial agency resources are often needed to review and approve these types of modifications since, in large part, they typically require submission of information that facilities did not anticipate. Agency enforcement actions may be initiated due to a facility's failure to follow the regulations and/or permit requirements related to changes of ownership or operational control. This further extends the timeline.

In some situations, only parcels of land are sold, not the whole facility. For example, facilities may request permit modifications in order to transfer ownership of portions of property that are part of a RCRA regulated facility but have been fully remediated (or were never contaminated). When land is removed from the jurisdiction of a permit (parceled) via a permit modification, close coordination of permit writers and corrective action (remedial) project managers is needed to ensure that it is appropriate to remove any land from the permit jurisdiction. The preparation to assess the parcel also involves coordination with the facility regarding any additional analyses or actions (e.g., property legal surveys) that need to be conducted relative to the property proposed for parceling.

One state has found in their experience that Class 1 modifications that involve changes in ownership and/or operational control usually take much longer than 100 hours (the high end of ASTSWMO's calculated range previously mentioned), especially with complex facilities that only transfer/sell the active portions but retain portions that require corrective action and post-closure care (all under one permit).[19]

This situation at times requires a new permit for owners/operators that do not already have a permit.

The need for prior financial assurance approval is frequently overlooked in new ownership cases and results in application processing complications and increased timeframes. The workload includes technical review of the financial assurance mechanism and determination that the new operator has provided documentation to show sufficient financial resources to operate and to eventually close the facility in compliance with the permit.

Modifications are further complicated if they involve more than one company that own different parts of the property the property is under one permit.

Complexities in Ownership [illegible] Financial Assurance

The Detrex Corporation in Charlotte North Carolina transferred facility ownership and environmental liabilities to Trex Properties LLC. This case study shows how a seemingly simple Class 1 can be complex and require substantial agency resources to review and approve.

When the Detrex Corporation announced its intent to transfer facility ownership and environmental liabilities to Trex Properties LLC, the North Carolina Department of Environment and Natural Resources (NCDENR) reminded Detrex of the requirement to submit a Class 1 permit modification request at least 90 days prior to the transfer. Regardless, the modification request was not received by NCDENR until nearly a month after the properly handled Class 1 modification request was submitted. It was substantively incomplete, most notably the facility had yet to submit financial assurance for Corrective Action. NCDENR issued a Notice of Deficiency for the modification request, requiring the companies to submit all information required for the transfer and to meet all outstanding compliance obligations before the agency would process the modification.

The modification process in this case spanned five months, in part due to disagreement over the amount of financial assurance required. Because Detrex had not supplied an estimate of corrective action costs as required by NCDENR, the state agency set the financial assurance amount at $1.2 million. Trex requested to supply an engineering affidavit in place of the required corrective action strategic remedy, but NCDENR and the state Attorney General's Office determined that an affidavit would not be sufficient. Ultimately, Trex bonded the legal $1.2 million, and the permit modification was approved. This Class 1 modification involved additional complexity, but is too detailed to include.

Outcomes: Although the permit modification process in this case was lengthy and required substantial agency resources, critical compliance issues were addressed before the permit was approved. Ultimately, the permit modification supported long-term environmental protection (by ensuring funding for closure and any needed cleanup of contamination) and also facilitating administrative updates.

Associated Workload:

- Assessment of the liability coverage, legal boundaries, basic facility information, compliance information.
- Development of a full remedial strategy.
- Cost estimation for remediation, and related financial assurance.

[19] Communication with the Waste Permits Division of the Texas Commission on Environmental Quality 10-23-15.

B. Improving Hazardous Waste Management

As hazardous waste management evolves, facilities often need to make changes to better protect the environment while treating, storing, and disposing of hazardous waste. The changes addressed in these permit modifications included the adoption of new methods of environmental protection, waste reduction, resource conservation, construction of onsite units to avoid offsite impacts, reducing risk of release, compliance with environmental standards, and other benefits for environmental protection that reduce risks to human health and the environment. In general, "green" permit modifications not only improve the environment, they may also improve operational efficiencies and economic development in the long run.

INDEX B. Improving Hazardous Waste Management
Case Study Categories
1. Resource Conservation
2. Reduced Risk of Release and Improved Safety
3. Replacement of Damaged or Aging Equipment

B.1. Resource Conservation

One of RCRA's primary objectives is to conserve valuable material and energy resources. There have been many improvements to waste management activities over time that improve efficiency of processes and thus contribute to this goal. In addition, facilities also often find cost savings when employing these types of improvements to their operations.

Operational change to treat hazardous waste-contaminated metal

A hazardous waste burning cement kiln located at a facility in Missouri has a scrap metal waste stream from crushed and shredded drums. Prior to its permit being modified, this was the only waste stream that continued to be sent off-site for disposal as a hazardous waste since there was simply too much hazardous waste residue on the metal for it to be recycled as scrap. The facility initially explored several methods for cleaning the metal to remove enough of the hazardous waste residue so that it could be recycled.

After initial exploration of various metal cleaning methods, the facility requested (and the Missouri Department of Natural Resources approved) a Class 3 Modification to build a gasifier unit in order to clean the metal (gasify the residuals on the metal). This would create gas that the facility could use as supplemental fuel to fire their hazardous waste burning cement kiln and render the metal, after post-gasification rinsing, clean enough that it could be recycled as a non-hazardous material as opposed to being disposed of off-site as a hazardous waste.

The facility adapted the gasifier technology from another industry for this modification and set about constructing and pilot testing the operation. Several technical issues had to be assessed and overcome during the pilot-testing phase. Ultimately, while the process was successful in cleaning the metal to the degree necessary for recycling, the gas production rates and volume of metals that could be processed were not consistent with the original design projections. As a result, this process has not yet been put into full operation and it is unknown if the limitations identified during pilot testing can be overcome to the

extent necessary to support full operation. Nevertheless, this permit modification allowed for research, development, and demonstration of a novel approach to metal decontamination that resulted in an end product that could be recycled and that created supplemental fuel to fire the cement kiln.

Outcomes:

- Encouraged innovation and research, development and demonstrations of a novel approach to cleaning metal so that it could be recycled as metal scrap instead of being sent for off-site disposal as a hazardous waste.
- If technical issues can be overcome, the hazardous waste generation at this facility can be eliminated and large volumes of clean scrap metal can be recycled/put back into productive use.

Associated Workload:

- Technical review and approval of documents supporting the modification request, closure plan.
- Assess any comments from the 60 day public comment period on the request, and the 45 day comment on the draft revised permit and public hearing.

B.2. Reduced Risk of Release and Improved Safety

Hazardous waste management standards are designed to prevent the release of hazardous wastes. Changes are often made via permit modifications to improve waste handling practices and further reduce the risk of releases to the environment. Other changes are made to specifically address safety concerns.

Improvements to hazardous waste handling can also be triggered by other environmental requirements. In particular, recent air pollution control regulations have driven environmental improvements to the management of certain hazardous wastes. See the highlighted case study.

Material and waste management requirements not governed by RCRA can sometimes trigger RCRA permit modifications. A case study in another section (Section D.2.) shows how the addition of non-RCRA tanks triggered the need for a RCRA permit modification (since it could influence the secondary containment needed for RCRA waste).

Fire detection and prevention

A fire occurred at the Stericycle Tacoma facility in Washington that caused the re-examination of current permitted procedures. The permit was modified by the Washington State Department of Ecology to include new requirements to reduce the likelihood of a future fire at Stericycle Tacoma during flammable liquid pump-up operations, including the installation of new lower explosive limit monitors. In addition, new pump-up procedures were instituted at this facility.

Outcome:

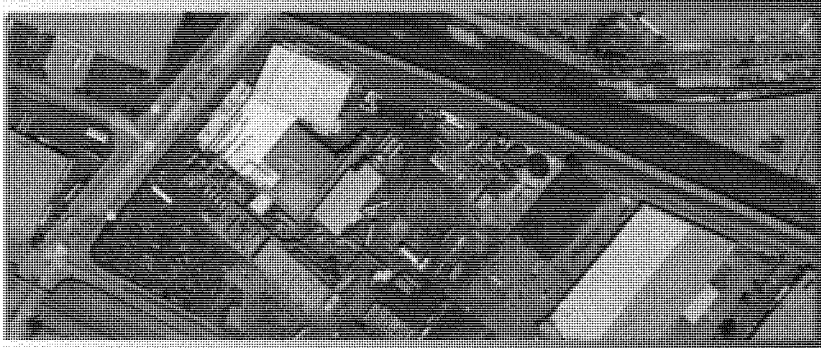
- Reduced risk of fires and better detection of potentially dangerous conditions.

Supported Compliance with Ambient Air Quality Standards

The Quemetco facility in Industry, California recycles batteries. The Battery Wrecker Process Area at the facility includes several permitted units, including the facility's battery wrecker, multiple tanks, and a conveyor. In March 2010, Quemetco submitted a request for a Class 1 permit modification to construct an enclosure around the Battery Wrecker Process Area to California's Department of Toxic Substance Control (DTSC).

The enclosure was necessary for Quemetco to comply with a new EPA standard for lead in ambient air and local air quality regulations for Large Lead-Acid Battery Recyclers. Construction of the enclosure would capture fugitive lead emissions from the battery wrecker process. The permit modification would not affect the type or quantity of lead-acid batteries recycled at the facility.

As part of the permit modification process, Quemetco was required to submit a copy of its financial assurance for the Battery Wrecker Process Area Enclosure within 60 days of the modification approval. The process also required Quemetco to send a notice of the modification to all contacts on the facility's mailing list and the appropriate state and local government contacts. The modification was approved in November 2010.



Outcome: Reduction in the amount of lead in the ambient air and compliance with new air regulations.

Relocation of hazardous waste handling from dense urban area to an industrial area

A commercial waste treatment facility commenced operation in 1980 in what was, at that time, a rural area in the state of Washington. Over time, residential and other commercial land uses in the immediate vicinity of the facility have greatly increased. A permit modification by the Washington State Department of Ecology at the Stericycle Kent facility transferred a significant portion of the waste handling (free liquid pump-up operations and shredding of RCRA wastes) to another facility located in an industrial area away from more populated areas.

Outcomes:

- Reduced risk to the populated urban area.
- Responded to local community concerns and urban encroachment issues.

Enclosed lead smelting structures due to changes in the air regulations

Recent air regulations were applied to the secondary lead smelters that required that the storage of lead containing materials/wastes be totally enclosed. The air regulations required that materials/wastes being stored prior to re-smelting be managed in enclosed containment structures under negative air pressure. Containment structures/buildings necessary to meet the air requirements had to be constructed in accordance with the RCRA containment building regulations. This necessitated issuance of temporary authorizations and permit modifications by the Missouri Department of Natural Resources to facilitate construction completion by deadlines associated with the air regulations. The new structures better prevent releases to the environment and, in many cases, replaced outdoor storage of lead-bearing materials.

Outcomes:

- Improved environmental conditions for ambient air quality by reducing the amount of lead in the ambient air.
- Diminished the potential for airborne lead to be deposited and accumulated on the land and in nearby water bodies, which in turn, protected nearby populations and diminished the potential need for corrective action investigation and remediation.

B.3. Replacement of Damaged or Aging Equipment

As equipment to manage hazardous waste ages, it needs to be periodically replaced. The equipment can eventually show signs of corrosion from the natural elements and from "wear and tear." This equipment must be routinely inspected, maintained, and replaced as necessary to minimize the potential for releases of hazardous waste to the environment.

Replacement of New Equipment

A Class 2 permit modification was requested for the replacement of old sink/float tanks with new washers at the Quemetco facility in Industry, California. This was approved by California's Department of Toxic Substance Control (DTSC). The replacement of aging sink/float tanks normally requires a permit modification and is necessary to minimize the potential for ensuring the appropriate washing separation of hazardous waste from the other materials to protect the quality of the finished recyclable products. The plastic from the battery casings crushing operation are later recycled into paint cans.

Outcomes:

- Prevention of leaks or other releases by replacing old tanks with new tanks.
- Improvement of air quality by ensuring that less lead is attached to the plastic components of batteries prior to smelting
- Increase of the quality of finished recyclable products by reducing the lead components of the recyclable products.

C. Ensuring Long-Term Protection

Hazardous waste permits (and other regulatory instruments) have requirements for facilities to: (1) update closure or post-closure plans and financial assurance instruments/amounts to address future long-term environmental obligations; (2) conduct corrective action to address historical releases to the environment; and (3) provide notification of and address, as appropriate, any new releases and/or discovery of previously unidentified releases. This section discusses the different modifications used to address those issues.

INDEX C. Ensuring Long-Term Protection
Case Study Categories
Closure, Post-Closure Care and Corrective Action

Closure, Post-Closure Care, and Corrective Action

This category includes updates to closure and post-closure plans and selection of final remedies for corrective action.

Compliance with the closure and post-closure plans ensure that the environment will be protected long after the facility closes its permitted hazardous waste management units. If facilities do not clean close their unit(s), they will need to comply with standards for units closed with waste in place, including providing post-closure care. Additionally, RCRA permits must include requirements for facility-wide corrective action to address releases of hazardous waste and constituents. Certain key stages of the corrective action process (e.g., final remedy selection and implementation) often require modification of the permit to incorporate requirements into the permit, because they are frequently not identified at the time of permit issuance. The modification procedures involve public review and comment on proposed final remedy actions.

Cleanup and final remedy selection

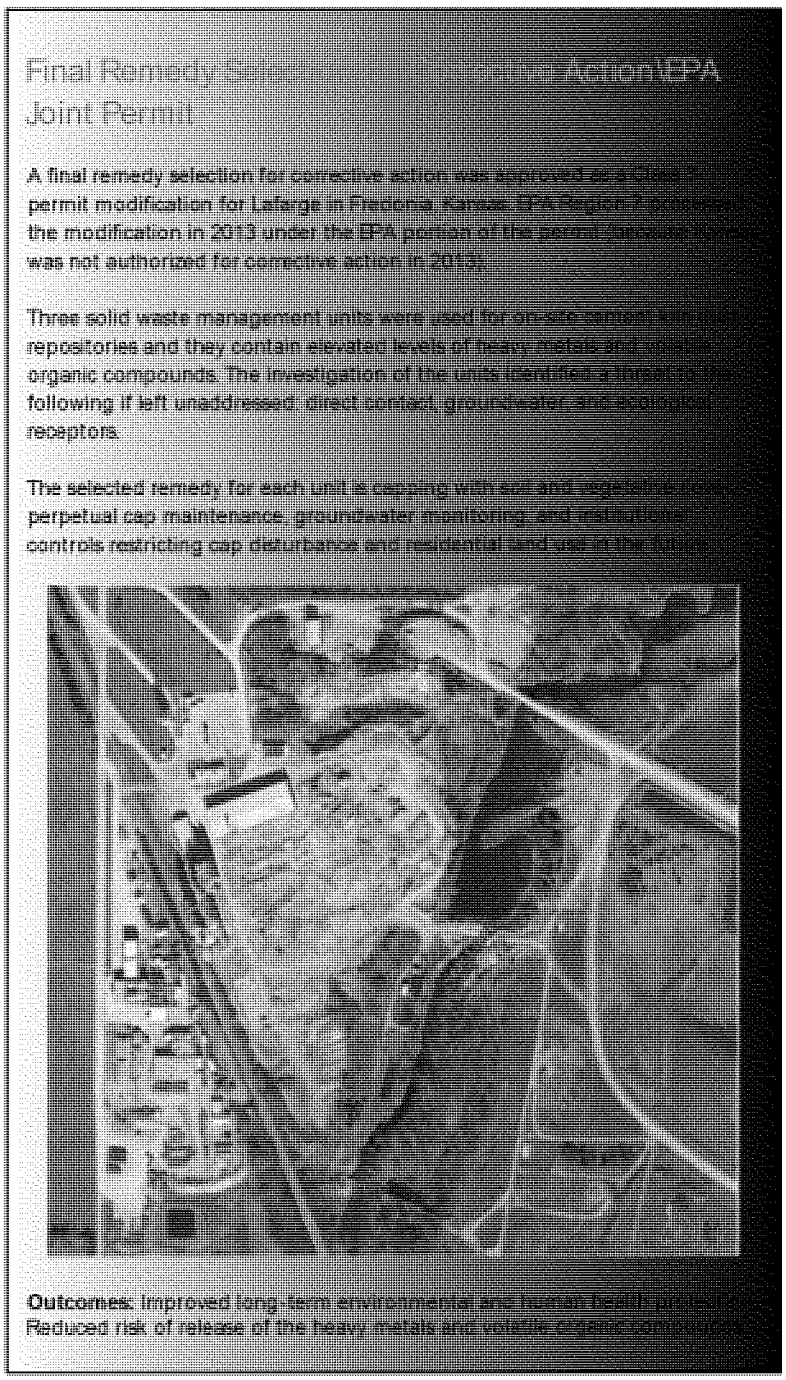
The U.S. Army Redstone Arsenal (the Arsenal) located in Huntsville, Alabama, requested a permit modification for numerous changes that included: (1) the addition of a new permittee; (2) removal of seven solid waste management units (SWMUs) from a list of units needing investigation; (3) addition of two SWMUs that require investigation; and, (4) the removal of three SWMUs from a table specifying that corrective measures are needed. The new operator of the permitted open burn/open detonation areas of the Arsenal needed to be included as an additional permittee in order to better define the responsibilities of the onsite entities. This permit modification by the Alabama Department of Environmental Management also included the incorporation of the selected remedies to reduce contamination at six SWMUs within the Arsenal.

The permit modification requests with the completed investigation reports were included in the corrective measures implementation (CMI) plans for the respective SWMUs. The associated investigations were completed in about a year and area specific conditions of these units, from the CMI work plans, were added to the permit. These area specific conditions included summaries of the remedy, any land use restrictions for the site, and any long-term monitoring and maintenance activities required.

This addition to the permit of two new SWMUs that require investigation required the submittal of a SWMU assessment report. These modifications were needed for the areas to be properly investigated.

Outcomes:

- By adding a new permittee, the responsibilities were better defined, including a requirement to comply with submittal dates and schedules of compliance.
- Final remedy selection for 6 units was approved that resulted in the excavation and removal of contaminated soil and reduction/elimination of groundwater contamination sources.
- The selected remedies included the excavation and offsite disposal of about 2,870 cubic yards of perchlorate-contaminated soil, 45 cubic yards of TCE-contaminated soil and about 42 cubic yards of soil contaminated with benzo(a)pyrene and dibenz(a,h)anthracene.



Associated Workload:

- To complete this modification, several documents had to be reviewed: correspondence letters, RCRA Facility Investigation Reports, CMI work plans and SWMU assessment reports.
- Comment letters and notice of deficiencies were prepared to highlight missing information and to request clarity regarding the Army's submissions. Revised documents were submitted to the Alabama

Department of Environmental Management for review.

- After the Department concurred with the Army's various documents, the permit was opened for modification. While incorporating the information and modifications described above, all references to those particular sections throughout the permit were checked for accuracy and modified where necessary to ensure proper reference.
- The draft permit was placed on public notice and no comments were received.

Addition of a risk management plan

The Occidental Chemical Company requested a Class 3 permit modification for its Geismar, Louisiana, facility to incorporate a Risk Management Plan as part of the final remedy being implemented under their post-closure permit. Financial assurance was put in place as part of this permit modification to ensure that there is funding to address contamination through corrective action.

The RMP includes beneficial reuse provisions for on-site soils that meet Risk Evaluation/Corrective Action Program (RECAP) soil standards. This is a common beneficial reuse practice that allows the facility to save money by not having to purchase additional soil for on-site use, or having to pay for disposal of certain soils as long as they meet the RECAP standards. The Louisiana Department of Environmental Quality approved this request.

Outcomes:

- The Risk Management Plan specified the corrective action final remedy and ensured the continuation of standards for protection of environmental quality after unit closure.
- Financial assurance was put in place for future corrective action activities to ensure funds will be available to conduct those activities even if the facility should experience financial difficulty or insolvency.
- The Risk Management Plan provides for beneficial reuse of soils on-site and cost savings for the facility.

Associated Workload:

- Public participation for this Class 3 modification included review and response to comments from the following: the required a pre-application public meeting with the, 60-day public comment period for the application, then a 45-day public comment period for the actual draft permit modification decision to be made.
- This modification required technical review by both a permit writer and geologist in order to make the final permit revisions.

Comprehensive risk reassessment, NPL-listing avoidance, and further investigation in support of an updated final remedy and facility property reuse/redevelopment

The National Nuclear Security Administration at the Bannister Federal Complex in Kansas City, Missouri, requested a Class 3 permit modification to add adjacent, previously unpermitted U.S. General Services Administration (GSA) property to their existing Hazardous Waste Management Facility Part I and EPA Hazardous and Solid Waste Amendments Part II Permits. This was intended to facilitate performance of a holistic environmental reassessment of the combined property in light of the pending move of the National Nuclear Security Administration and GSA personnel to new work locations. The modification was also needed to implement further remediation and potential near-term transfer of a portion of the permitted property to a private entity for subsequent reuse/redevelopment. This modification also served to keep the facility from being proposed for listing on the Superfund National Priorities List (NPL).

This modification to the permit by Missouri Department of Natural Resources was inherently complex since there were/are multiple owners/operators (including a new owner/operator being added), many prior uses of the land by many past owners that led to contaminant releases (primarily chlorinated solvents, polychlorinated biphenyls and petroleum hydrocarbons). A "Formerly Used Defense Site" located on the "annexed" GSA property is being handled by the U.S. Army Corps of Engineers and there is a great deal of public and political interest in the cleanup, disposition, and redevelopment of this aging (over 70 year old) federal complex.

Outcomes:

- Permit modification elements related to groundwater and the updated plan have been implemented. The other elements are in various stages of the review and approval process.
- There are weekly coordination calls on this project between the Department and EPA and monthly coordination meetings among all project stakeholders including the preferred private developer.
- In addition to the activities required of the current permittees by the permit modification, the preferred developer is in the process of:
    - Performing confirmatory due diligence investigations to independently assess environmental conditions.
    - Assessing updated final remedies in light of anticipated future reuse/redevelopment of the property.
    - Assessing the associated future costs as the basis for financial assurance needed to facilitate the early dirty (negative equity) transfer of this federal property to the private developer and thereafter ensure adequate financial assurance is provided for post-closure care and corrective action after the permit is transferred.

Associated Workload:

The primary permit modification elements included the following:

- Implementation of a groundwater remedy optimization plan and revised groundwater sampling and analysis plan to incorporate new wells on the "annexed" property,
- Implementation of updated groundwater analysis and reporting requirements,
- Revision and implementation of an updated Community Involvement Plan (CIP),
- Update the conceptual site model and identify any data gaps that required further investigation given the land area added to the permitted facility (Missouri DNR submitted a facility-wide report: "Description of Current Conditions Report and Screening Level Risk Assessment"), and
- Assessed a facility-wide polychlorinated biphenyl (PCB) fate and transport study in order to inform the permit modification decision.

Soil and groundwater sampling requirements in closure plan

The Aerojet facility, in Rancho Cordova California, requested a Class 2 permit modification in order to update the soil and groundwater sampling requirements in the closure plan. The closure plan revisions included additional sampling and analysis in order to further investigate the underlying soils. The closure plan also included changes in the closure cost estimate. California's Department of Toxic Substance Control assessed the permit modification request.

Outcomes:

- The vertical and lateral extent of perchlorate contamination in soils and the impact of perchlorate to the water table were identified.
- The results were used to determine if the unit could be clean closed or would need to be addressed through post-closure requirements.

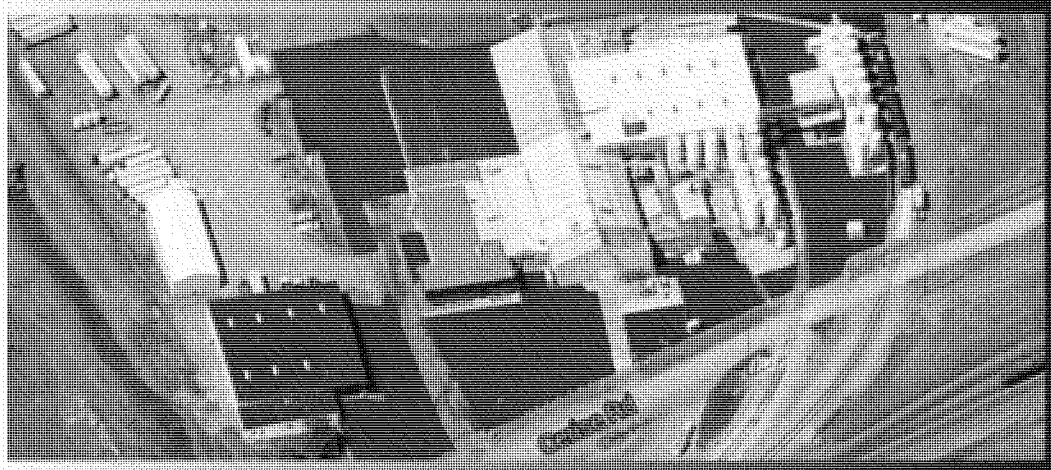
Associated Workload:

- Public notice and preparation for/participation in public meetings.
- Assess groundwater reports and follow up on them.
- Financial assurance assessment.

Remediated Area for the Open

Loveland Products, Inc. (LPI), in Billings, Montana, requested a permit modification to change post-closure care and corrective action requirements for a closed surface impoundment. The existing permit requirements limited use of the area [illegible] the surface impoundment and presented geotechnical problems for construction of a new warehouse. A permit [illegible] was necessary to allow removal of the asphalt cap and excavation and shipment of the enclosed waste to an off-site [illegible] hazardous waste landfill. LPI requested a temporary authorization to allow excavation work to begin while permit [illegible] procedures were being conducted. DEQ granted the authorization following public notice to all persons on the [illegible] list and to appropriate units of state and local governments. The temporary authorization allowed excavation [illegible] the waste to be accomplished during Montana's short construction season, avoiding environmental and human [illegible] exposure issues associated with excavations left open through the winter months.

Approximately 12,000 tons of hazardous waste and contaminated vadose zone soil was removed from the surface impoundment and disposed in a permitted hazardous waste landfill. The hardcover cap, originally installed to protect [illegible] workers and groundwater, is no longer required. LPI was able to construct a warehouse in the area, reducing [illegible] footprint of its facility.



Outcome: The modification demonstrates that regulated hazardous waste units can be remediated and the [illegible] wastes and contaminated vadose zone soil were removed from the surface impoundment area to make the [illegible] construction and reuse.

Coordination, timing, and complexity: This permit modification was multi-faceted, requiring coordination between the Montana Department of Environmental Quality, the facility, EPA, and the state environmental control [illegible] the excavated waste. Meetings to discuss the project were held several years prior to implementation. Timely [illegible] approval of the modification request was necessary and important to accommodate the planned construction [illegible]

The permit modification was complex; it involved a shortening of the post-closure care period, a change in the [illegible] remedy, a determination of Corrective Action Management Unit eligibility, temporary authorization, and final modification approval. The modified remedy required extensive understanding of the requirements needed to address waste [illegible]

D. Keeping Permits Up to Date

Permit modifications are often required for straightforward updates to align the permit with current conditions and operations at facilities. It is important for the permit to reflect the current facility information, provisions, and standards in the event that emergency situations arise. This also facilitates appropriate facility inspections by state and federal regulators.

One common type of permit modification relates to changes to the "General Permit Provisions" and "General Facility Standards" as outlined in 40 CFR 270.42 Appendix I. These updates are generally Class 1 modifications (some of these Class 1 modifications need prior Director's approval).

Many of these changes are administrative updates. Some of these are needed for emergency response (including changes to facility contacts), waste sampling changes, and other changes needed to keep the permit current and compliant.

INDEX D. Keeping Permits Up to Date
1. Emergency Response
2. Updates to Permit Standards and Conditions
3. Administrative Updates

D.1. Emergency Response

It is important to have current safety and emergency response information available and related equipment ready in the event there is a fire, spill, or other emergency at a permitted facility. There are permit modifications that owners and operators of permitted facilities must propose when certain changes are made at the facility. These changes include things such as updated emergency/contingency plans, emergency contacts, and emergency equipment. In addition, EPA has continued to emphasize the "Preparedness and Prevention Requirements for RCRA TSDFs" including ongoing communication and coordination with State Emergency Response Commissions, Local Emergency Planning Committees, local fire departments, and other state and local emergency response authorities, as appropriate.[20]

Coordination of emergency services, emergency contacts, and other updates

Rho-Chem LLC implemented a Class 1 permit modification to update facility information in the contingency plan. This included the following updates: the coordination of emergency services, spill control equipment, artificial night lighting, compliance history, and emergency coordinator (including alternates). This facility in Inglewood, California worked with California's Department of Toxic Substance Control on the permit modification. Public notices were sent as required by the regulations to state and local agencies and the mailing list within seven days of implementing the changes.

[20] A March 5, 2010 EPA memo was sent from Matt Hale to the EPA RCRA Directors on "Preparedness and Prevention Requirements for RCRA TSDFs (Response to Chemical Safety Board Recommendation 2007-01-I-NC)." The memo states that "this guidance recommends that the TSDF permit explicitly require that the owners and operators provide up-to-date written information about the facility and hazardous waste located there to State Emergency Response Commissions (SERCs), Local Emergency Planning Committees (LEPCs), local fire departments, and other state and local emergency response authorities, as appropriate." This guidance was also communicated to state programs through ASTSWMO.

Outcomes:

- Changes were made to update important safety/emergency response information at the facility.
- The regulators and public were notified of those changes to help facilitate timely coordination of emergency services and deployment of emergency equipment in the event of an emergency response.

D.2. Updates to Permit Standards and Conditions

The conditions governing management of hazardous waste in treatment, storage, and disposal units are specified in facility permits. Minor changes at any unit (or general facility standards) may trigger permit modifications. Seemingly simple Class 1 modifications can, after review by regulators, require substantial time and effort on the part of both regulators and permittees to complete. Sometimes proposed permit modifications are initially misclassified (i.e., a Class 1 modification request comes in from the facility but is determined by the regulatory agency to actually be a Class 2 or 3 modification). A great deal of the coordination with facilities often takes place before a complete permit modification request is even submitted. In addition, some permit modifications are actually precipitated by changes to requirements of other non-RCRA regulatory programs. A case study is described below how a non-hazardous unit addition could trigger a RCRA permit modification for secondary containment.

Addition of a Non-RCRA regulated tank to the secondary containment area for a RCRA regulated tank

A facility submitted a modification on October 30, 2013, to increase the capacity of their secondary containment for their tank farm. The increase was requested because they were replacing one non-RCRA regulated tank with two non-RCRA regulated tanks and the RCRA secondary containment volume requirements could be affected. The facility proposed raising the secondary containment wall with four-inch angle iron.

In order for North Carolina Department of Environment and Natural Resources (NCDENR) to assess the proposed modification, the facility needed to submit the following additional information: new permit-related drawings; inspection procedures; updates to the secondary containment volume calculations; angle iron installation specifications; and information regarding use of secondary containment sealants and inspection details for the altered secondary containment.

NCDENR and the facility had multiple discussions on the proposed changes to resolve issues so that the agency could begin processing the request. These discussions included helping the facility with the secondary containment calculations and requests for additional information. Because of the technical assistance provided by NCDENR, the facility ultimately determined that the angle iron extension was not needed as the secondary containment calculations contained an incorrect assumption regarding the shape of the bottoms of the new tanks. The existing secondary containment volume was sufficient since the new tanks had spherical bottoms and NCDENR agreed that a Class 2 modification was not needed to increase the secondary containment capacity, though a Class 1 modification was still needed for the changes. A revised permit modification request was submitted in December 2013 and the Class 1 modification was approved by NCDENR in May 2014.

Outcomes:

- NCDENR provided significant technical assistance to the facility to address issues associated with their proposed Class 2 permit modification to add new tanks.

- NCDENR determined that the facility's secondary containment calculations showed that the existing secondary containment volume was sufficient and thus the proposed changes would require a Class 1 permit modification with prior Director's approval in lieu of the proposed Class 2 modification.

Keeping the facility information updated in the permit

The HGST, Inc., facility in San Jose, California, requested several Class 1 permit modifications over a short period of time and all necessitated individual notices to the mailing list. The modifications included the following: (1) revised closure plan for three tanks including clarification of decontamination procedures and connecting piping system; (2) revised closure plan for seven tanks including clarification of the decontamination procedures for new equipment used to manage waste; (3) installation of tie in valves to improve the support and transfer function of a heavy metal waste pipeline; (4) owner's, operator's and facility name change from Hitachi Global Storage Technologies Inc. to HGST Inc.; and (5) administrative changes to update the inspection checklist for units and update training plan job titles. The permitting agency, California's Department of Toxic Substance Control, processed the permit modifications.

Outcomes:

- Closure decontamination procedures were clarified and improvements were implemented to the support and transfer of a portion of the waste handled.
- The permit and related documents was updated to reflect current information, including current facility owner/operator information.

Replace hazardous waste storage unit containers with ones of a different type and size

This Class 2 permit modification request from Rho-Chem LLC resulted in replacement of certain hazardous waste storage unit containers with others of a different type and size but did not increase the storage capacity at the facility. California's Department of Toxic Substance Control modified the permit.

Outcome:

- Replacement of hazardous waste storage container units with different types that were better suited for the ongoing operations at the facility.

D.3. Administrative Updates

Permit modifications are often requested for administrative or informational purposes that are not related to physical improvements that need to occur at the facility. Although informational changes are typically simple and straightforward, they can require a surprising level of administrative effort from permittees and regulatory officials. For example, facility name changes are common and often trigger substantial additional review effort on the part of regulatory officials to confirm that the name change does not stem from a change in facility ownership or operational control, which would require updates to financial assurance or other compliance mechanisms.

Facility Name Change

In 2014, Evoqua Water Technologies LLC requested a Class 1 permit modification for its hazardous waste management facility in Vernon, California, to change the name of the owner and operator from "Siemens Water Technologies LLC" to "Evoqua Water Technologies, LLC." This is a common modification and seemingly easy, but as part of the modification process, Evoqua was required to notify all contacts on the facility's mailing list and the appropriate state and local agencies of the name change. California's Department of Toxic Substance Control permitting staff also had to review the request to ensure that it was not an ownership change and that the current financial assurance was adequate.

Outcomes:

- The permit and related documents were updated to reflect the new owner.
- Financial assurance was reviewed and confirmed as still viable/applicable.

Extend closure period due to funding delays

The National Aeronautics and Space Administration (NASA) in New Orleans, Louisiana, requested a Class 1 permit modification to extend the closure period for three tanks by 180 days. This modification was necessary to accommodate funding delays resulting from the Federal government sequestration.

Outcome:

- Delays in the enforceable closure schedule were approved by the Louisiana Department of Environmental Quality.

E. Modifications over the "Life of a Permit"

A case study of permit modifications over the life of a permit shows the volume of permit modification work as compared to the individual case studies listed above.

ENVIROSAFE SERVICES OF OHIO INC, (OHD045243706)

This facility is located in Oregon, Ohio and has been permitted since 1988. It has more modifications per year than most facilities, but they are largely Class 1's. Although the table below shows the permit modifications that were entered in the national database, it does not show all the permit maintenance involved (for example, compiling environmental impact statements).

This facility has eleven hazardous waste management units that are permitted. It also has expansive facility-wide corrective action that is being addressed under the authority of the permit. This facility has permitted storage and treatment units in addition to a landfill that will continue to need post-closure care under the permit when closure obligations have been satisfied.

Note that the permits below were issued by both EPA Region 5 and Ohio EPA. As states have become authorized for all of the RCRA programs, joint permits between the State and EPA have become less common. The information about the individual permit modification approvals often references a specific section of the permit and the unit or well referenced in the change to the permit. The vast majority of these modifications are requested by the permittee, but the permit modification workload has included Agency-initiated modifications as well. Ohio EPA has historically used Director-initiated modifications for selection of corrective measures for RCRA Corrective Action. For this facility, a Director-initiated modification selecting a containment strategy for historic waste management units on a portion of the facility was approved September 12, 2006. These rare Director-initiated modifications generally require a similar process to issuing a full permit and are typically as complex as Class 3 modifications.

Dates	Type of Permit Modification (Mod)
11/8/88	**Federal portion of the permit issued by EPA Region 5**
5/8/91	**State portion of the permit issued by Ohio EPA**
Mods under the First set of Permit Issuances by EPA and the State	
	1 Mod Approval for Additional Capacity.
	2 Class 3 mod approval for vertical expansion.
	6 Mod Approvals for Groundwater Monitoring.
	58 Mod approvals for unspecified ("Other") mods.
	Note: No mods were documented for the first 10 years; there may have been some mods, but not captured in the early ears of tracking RCRA data.
12/29/05	**Joint Permit issued by the state program, Ohio EPA (Renewal)**
	Joint Permit Issued by the EPA, Region 5. (Renewal)
2/21/06	(Federal portion of joint RCRA permit covering 40 CFR Subparts BB, CC, and DD)
Mods under the Second set of Permit Issuances by EPA and the State	
2006 Mods	
2/3/06	Update facility annual closure/post closure cost estimate.
2/21/06	Mod Approval (Other Mod)
3/16/06	Class 1A Mod approval to install a portable high capacity vacuum system.
4/3/06	Class 1A approval for (PQL's), addition of statistical comparison standards, revised well construction logs for monitoring, and addition of method 420.1
5/3/06	Mod regarding analytical methods.

5/18/06	Approval to remove ground water monitoring wells SW-3D and MR-4S and add ground water monitoring well F-2D to affected well list for Total Phenols.
6/9/06	Approval to add previously approved and/or acknowledged mod to ESOI's December 29, 2005 permit.
8/17/06	Class 1A mod approval to replace outdated HDPE liner specifications on Table 1 of Appendix D.7.4 of permit application with standard HDPE specifications.
9/12/06	This permit mod was initiated by Ohio EPA to incorporate permit specific corrective action measures that collectively represent a containment strategy for old waste management units in the northern portion of the facility.
10/20/06	Class 1 mod approval to update City of Toledo Raw Waterline Security Agreement Weekly Inspection form.
10/20/06	Class 1 mod approval to remove the form of precipitation from permit condition J.7(b)(iii).
11/10/06	Class 1 mod to allow facility to utilize analysis of wells which are sampled in accordance with the permit and in the calendar month preceding an April and/or October semi-annual sampling event.
11/10/06	Class 1A mod approval to add and remove monitoring wells, remove benzene and selenium & fluoride
2007 Mods	
2/6/07	Class 1 mod approval to make changes to the inspection forms MF-02b (Containment Building) & MF-13 (Groundwater Monitoring Wells).
3/13/07	Class 1 mod approval for complete clean copy of the permit application.
3/16/07	Class 1A mod approval to add leachate collection and removal system performance objectives for WMSs 5, 6, & 7.
3/21/07	Class 1A mod for change in the methodology for determining hydraulic gradients and travel distances used in the ACL model.
3/29/07	Class 1A mod approval to replace the June 30, 2006 permit application with the former permit application dated August 15, 1983.
4/13/07	Class 1A mod approval to update affected and adjacent well listing at Appendix E9 to add R-23, G-1DA, and G-1S as wells nested or adjacent to affected wells.
4/20/07	Class 1 mod approval for information on two newly installed monitoring wells.
5/8/07	Class 1A mod approval for data validation definitions in Appendix E12 of Part B.
5/17/07	Class 1 mod approval for the Contingency Plan emergency contact information.
5/17/07	Class 1 mod approval for changes to Table of Contents to update reference to inspection forms MF-02b & MF-13.
5/17/07	Class 1 mod approval for changes to the closure/post closure cost estimate.
6/6/07	Class 1 mod approval to replace Part A RCRA Subtitle C Site I.D. form with EPA Form 8700-23.
6/20/07	Class 1 mod approval to correct revision numbers for detail drawings.
8/10/07	Class 1A mod approval to establish a target leachate head level for the west area of SWMU 5.
10/5/07	Class 1A mod approval to update dioxin/furan analysis.
11/9/07	Class 1A mod approval for update to add procedures to prevent inadvertent introduction of petroleum constituents to groundwater samples when using fueled field equipment.
11/9/07	Class 1A mod approval to include total metal prediction limits.
11/9/07	Class 1A mod approval to clarify that the ACL for areas subject to corrective action will not need to be reevaluated unless conditions change
12/5/07	Class 1 mod for informational changes (revise Permit Condition F.5 on page 91 of 165).
12/5/07	Class 1A mod approval for correction of conflicting information in the permit application regarding how earthen dikes will be constructed and managed on Hazardous Waste Landfill Cell M.
12/11/07	Class 1 mod to revise cover page for Appendix F.8 "Rail Line Inspection Forms" and revise forms MF-16(a).
2008 Mods	
1/7/08	Class 1A mod approval to update the statistical prediction limit at monitoring well
1/31/08	Class 1A mod to change the timing requirements for 3rd party data validation of semi-annual groundwater monitoring reports.
2/1/08	Class 1 mod approval to update Section G, Contingency Plan.
2/5/08	Class 1 mod approval to revise cyanide & sulfide testing methods and concentration limits.
2/8/08	Class 1A mod approval to include a Master Boring Log & Well Summary Table, Master Boring & Well log Location Drawings and well construction logs.
3/6/08	Class 1 mod approval for historical log submittal to ensure facility permit contains all boring, well construction, and well abandonment information.
3/6/08	Class 1A mod approval for Sampling and Analysis Plan updates.
4/10/08	Class 1 mod approval to add 1,4 dioxane to the affected constituent list for Monitoring Well SW-3D and to add Monitoring Well SW-3S to the affected well list for 1,4 dioxane.
5/8/08	Class 1A mod approval to add geologic cross section drawings 1 thru 10 covering the Integrated Ground Water Monitoring Program.
5/8/08	Class 1A mod approval.
5/28/08	Class 1 mod to update emergency coordinator info & revise fire brigade response personnel.
5/29/08	Class 1 mod to update closure/cost-closure cost estimates.
6/26/08	Class 1A mod approval total metals prediction limits for monitoring well R24 added to Integrated Ground Water Monitoring Program.

6/26/08	Class 1 mod to update list of boring and monitoring well information on page E.13-24.
8/20/08	Class 2 mod approval to discontinue the semi-annual analysis of the naturally occurring constituents: sodium, chloride, and fluoride as early warning indicators of a potential release from regulated units.
9/22/08	Class 1A mod approval to add 1,4-Dioxanne , add MR-3S, add nickel to the affected constituent list, and remove MR-4D and SW-2D.
9/22/08	Class 1A mod approval to update the dissolved barium comparison standards for all IGWMP wells excluding M-18S, R-23, and R-24.
9/25/08	Class 1A mod approval to update the Master Boring and Well log, update the cover page, and add well abandonment logs.
10/17/08	Class 1 mod approval for revisions to Section E for typo corrections.
2009 Mods	
3/6/09	Class1A mod approval to remove existing cover page for appendix D.2, add pages D.2-1 and D.2-2, and replace Section D cover page and Table of Contents pages D-viii thru D-xi.
4/16/09	Class 1A mod approval benzene, chloroethane, and vinyl chloride from the COSs from affected well F-2S.
4/23/09	Class 1A mod approval to add total metals predictions limits for monitoring wells G-1DA, M-18S, and M-17D.
5/21/09	Class 1 mod to update the closure & post-closure cost estimate.
6/1/09	Class 1 mod for replacement and relocation of CSF safety showers with equivalent units.
6/2/09	Class 1A mod for implementation of schedule and final design plans for SWMI I (Cell F).
6/8/09	Class 1 mod for recalculating of secondary containment for Caustic Building and Tanks 70, 73 and 74.
7/17/09	Class 1 mod to clarify notification requirements of the Response Action Plan for Containment building.
7/17/09	Class 1 mod to replace existing appendix F.10, F.10-1, and F-1(p) pages in the permit application.
7/21/09	Class 1A mod to require security at gates only when open or unlocked, and typo corrections.
8/20/09	Class 1 mod to replace Section D Table of Contents, replace existing Appendix D.5, and add pages D.5.1.
8/20/09	Class 1 mod to include the "Cell M Transducer Certification Report - May 2009."
9/8/09	Class 1A mod to Appendix D.15 Submersible Pumps and Transducer Specifications of Part B application.
9/15/09	Class 1 mod to replace existing pages D-12 through D-15, 17, 23, and 58.
10/7/09	Class 1A mod to revise and relocate the Stone Drain Column Specifications from Appendix D.31.
10/21/09	Class 1A mod for changes to Appendix E.13, Boring and Monitoring Well Information.
10/21/09	Class 1 mod to Appendix E.9 from affected well list, removal of benzene from affected constituent list and removal of trichlorofluoromethane.
11/6/09	Class 1A mod approval to allow for management of mixed RCRA & TSCA remediation waste with total PCBs concentrations.
11/27/09	Class 1 mod approval for changes to the Table "Maximum PQLs" located in Attachment C to Appendix E.9.
12/9/09	Class 1 mod approval for changes to ground water monitoring well reference point elevations.
12/17/09	Class 1A mod approval for changes in total metals prediction limits for monitoring wells and total cyanide prediction limit.
2010 Mods	
2/1/10	Class 1A mod to Module G (waterline trench monitoring program) to clarify the inspection, record keeping, and reporting requirements.
2/10/10	Class 2 mod approval to reduce height of Cell M landfill from 714 feet MSL to 700 feet MSL.
2/26/10	Class 1 mod for administrative and correctional updates i.e. revise pages G-1 and G-33. Update emergency coordinator information and update the Fire Brigade response personnel.
3/3/10	Class IA mod to replace Module K permit pages 140 to 156 with revised pages having the same page number.
3/12/10	Class 1 mod for page replacement in the Part A Application.
4/14/10	Class 1A mod for removal of dissolved barium from the affected constituents of concern list for affected well SW-2S.
4/21/10	Class 1A mod for revisions to Module J of the Permit regarding pumping inspection, reporting & maintenance requirement for Cell M's leachate collection system, ...
5/18/10	Class 1 mod for administrative and informational changes.
6/22/10	Class 1A mod approval to add prediction limits for total metals for Monitoring Wells I-5SA and MR-3S.
6/22/10	Class 1A mod approval to clarify miscellaneous groundwater items in the Permit and Part B Permit Application.
7/6/10	Received request from facility on 7/6/10 to WITHDRAW previous mod to provide updated performance monitoring for leachate extraction at SWMU's 5, 6 & 7.
8/23/10	Class 1A mod approval to upgrade the leachate extraction systems.
8/23/10	Class 1 mod approval to update the closure and post-closure cost estimates.
10/14/10	Class 1A mod to update Appendix E.9, Groundwater Monitoring Program Sampling and Analysis Plan
10/27/10	Class 1 mod to replace existing pages D.49-8 and D.49.9 and replace the existing Appendix D.49 Cover Page.
11/15/10	Class 1 mod replace module conditions J.1dv and J.1dva on page 119 of 165 and J.4ei and J.4eii on page 127 of 165. Also, replace existing permit application page G.1-3 with revised page dated September 27, 2010.
11/24/10	Class 1 mod to remove outdated info from the Container Storage Area Inspection form MF-07 of the Part B Permit Application.

2011 Mods	
1/11/11	Class 1 mod to permit conditions B.5 and B.5(b) & B.5(b)(iv) to specify inspection frequencies.
2/11/11	Class 1 mod to allow for container storage in any of the designated storage areas within the Stabilization/Containment Building up to the aggregate total storage capacity of 1185 cubic yards.
3/21/11	Class 1A mod approval to clarify language for Table B-1 and allows the processing of certain soil and debris wastes.
5/12/11	CLASS 1A Mod to update Attachment D, Affected and Adjacent Well Listing. Chloroethane has been added to monitoring Well F-2S.
6/20/11	CLASS 1A Mod to update the OMPM Plan for leachate extraction at SWMU 5, 6, and 7.
7/29/11	CLASS 2 Mod to treat hazardous waste containing free liquids and to add chemical oxidation, chemical reduction, and activated carbon treatments in the Stabilization/Containment BLDG.
7/29/11	CLASS 2 Mod to treat hazardous waste using encapsulation technology within 4 open-top metal tanks in Cell M.
2012 Mods	
1/25/12	CLASS 1 Permit Mod - Groundwater monitoring program sampling and analysis plan - Changes to plan as it related to sampling wells with high turbidity water.
1/25/12	CLASS 1A Permit Mod - Groundwater monitoring program sampling and analysis plan - changes to plan - affected and adjacent Well listing, 1,4 - Dioxane was removed from the affected constituent list at Well MR-1SA.
2/7/12	CLASS 1A PERMIT MOD - Revision of permit condition B.3(J)(I) to correct the citation reference to the mixture and derived-from rule in OAC 3745-51-03.
3/21/12	CLASS 1 Permit Mod - Updating the facility closure and post-closure cost estimates for inflation.
3/21/12	CLASS 1 Mod - Updating several inspection checklists used by the facility to reduce duplication and remove irrelevant questions.
8/2/12	CLASS 1A Mod to update prediction limits for barium (dissolved) at Well G-2DA and cyanide at Well R-6.
2013 Mods	
3/19/13	CLASS 1A Mod to change prediction limits for each qualifying monitoring well and a detailed description of the methods used to calculate the statistical comparison standards for the monitoring wells.
4/10/13	CLASS 1A Mods to Update: 1) Addition of tetrahydrofuran to the Affected Constituent List for Well SW-025 2) Removal of tetrahydrofuran from the Affected Constituent List for Well SW-03D 3) Removal of nickel from the Affected Constituent List for Well SW-035
4/10/13	Class 1A Mod to remove nickel from the affected constituent list for Well MR-045.
10/1/13	Class 1A mod approval to change attachment D, affected and adjacent well listing.
11/25/13	Class 1 mod approval to change EL and EH definitions and update well logs due to maintenance of well DUG-1.
11/26/13	Class 1A mod approval to reduce waste minimization requirements and reduce the required submittal of waste minimization reports to OEPA from every two years to every five years.
12/24/13	Class 1 mod approval to update permit conditions b.25 and k.7 to correct rules citations and update to current language for biennial reporting and to update section E.9 and section J of the permit application to correct rules citations and update for biennial reporting.
12/24/13	Mod approved to 1)Update dates of closure for cell M, Storage areas H and K and storage tanks s100, s200 and s400 in section 1 of permit app. 2) Correct typographical errors and remove outdated language from section 1 of permit app and 3) Update closure and post closure cost estimates and financial requirements for inflation in appendix 1.5 of the permit app.
This information came from RCRAInfo event codes on permit determinations and mod approvals. The detail about the mods was taken verbatim (in most cases) from the notes section for the permit mod approval event codes.	

APPENDIX

1. Modification Types Based on Regulatory Descriptions

This document includes: (1) the regulatory classifications for types of permit modifications and a crosswalk to applicable regulations, and (2) a table with the classification of permit modifications (Appendix I to §270.42).

2. Permit Modification Data: Background and Details

This document provides additional information and background on how the data for this report was collected, including the specific method for how information was retrieved and analyzed from EPA's national hazardous waste database (RCRAInfo).

~~~~ The materials in the appendix are contained in separate documents ~~~~
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A.5 NPDES Permit Issuance Timeframes

(not available online)

National Pollutant Discharge Elimination System (NPDES) Permits

CWA Section 402

EPA estimates that the NPDES program requires permit coverage for approximately 727,200 facilities or activities. Permit coverage is provided by one of two permit types: General Permits or Individual Permits. General permits are issued to a category or class of facility of activity, and are used to cover the vast majority (680,500) of discharges requiring NPDES permits. Individual permits incorporate more site-specific limits and conditions and are issued to a relatively small number (46,700) of the more complex facilities or activities. The universe of individual permits, comprises approximately 14,200 Publicly-owned Treatment Works (POTWs), 1,000 large and medium (i.e., populations > 100,000) Municipal Separate Storm Sewer Systems (MS4s) and 31,500 non-POTW (i.e., industrial, commercial) facilities or activities. State permitting authorities issue approximately 90% of the NPDES permits and EPA Regions and EPA Headquarters issue approximately 10%.

As noted above, NPDES **General Permits** are issued by a state or EPA to cover a class or category of activity. Procedurally, the state or EPA first drafts and issues the General Permit, and once issued, eligible facilities or activities seek coverage under the permit. Each General Permit establishes the specific process for seeking and granting permit coverage. In most cases, permits require submission of a "Notice of Intent (NOI)" to be covered, which usually requires basic registration information and perhaps some supplemental site-specific information. Each General Permit also provides the timing and process by which the discharge is authorized. For most General Permits, dischargers are authorized to begin the covered activity within a matter of days (e.g., 14-days following submission of a complete NOI). This timing varies from permit to permit, typically ranging from immediate authorization to a matter of days. Both existing and new dischargers eligible for coverage under General Permits utilize the same registration process; although there may be some additional information required under some permits for first-time registrants. See Table 1 for a breakdown of the major General Permit types and timelines.

NPDES **Individual Permits** require renewing and new dischargers to submit detailed application forms prior to the drafting of the NPDES Permit. See Table 2 for breakdown of the types, categories, and timelines for issuance of individual permits.

- **Renewing (existing) dischargers** that wish to renew their NPDES permit must submit a complete renewal application at least 180 days prior to the expiration of their existing permits. This timing provides permitting authorities approximately 180 days to draft the site-specific individual permit based on the information provided by the applicant. The NPDES regulations also provide that where an applicant submits a timely application for renewal of its NPDES permit and the permitting authority (EPA or State) fails to reissue the permit before the expiration date of the existing permit, the terms and conditions of the expired permit remain in effect and the discharge remains authorized until a new permit is issued. Because the CWA establishes a maximum term of 5-years for the 46,700 individual NPDES permits, approximately 20% (9,340) require renewal each year.
- **New (proposed) dischargers** are required under federal regulations to submit completed applications at least 180 days prior to commencement of discharge, which provides the permitting authority approximately 6 months to develop a draft individual permit. EPA estimates that a relatively small number of new facilities (200) apply for their first NPDES individual permit each year.

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Public participation is a key part of the NPDES permit issuance process. Authorized states and EPA must notify the public and any affected states of the issuance of a permit and provide an opportunity for comment. *See* CWA 402(b)(3). Additionally, depending on the permitting circumstances and applicable state/federal environmental statutes, the state permitting authority or EPA may have to consult with other entities (e.g., U.S. Fish and Wildlife Service, tribes). Any of these public participation and consultation processes can significantly affect the timing of permit issuance.

TABLE 1 – General Permit Categories and Timing (State- and EPA Issued Permits)

Facility/Activity Category	Approximate Number of Facilities/Activities	Approximate Time to Receive Coverage	Notes
Vessels	65,000	No NOI (immediate coverage) to 7 days (majority)	
Pesticide Applications	365,000	No NOI (majority) to 10 days	
Other non-stormwater	70,000	Varies widely. Typically several days.	
Stormwater: - Phase II MS4s - Industrial - Large construction - Small Construction	 6,000 90,000 36,500/year 48,000/year	 - Days to weeks - Varies days to months - 14 days - No NOI (immediate coverage) to 14 days	Coverages can be "held" where site-specific issues (e.g., ESA) identified.

TABLE 2 – Individual Permit Categories and Timing (State- and EPA-Issued Permits)

Facility/Activity Category	Approximate Number of Facilities/Activities	Approximate Time to Develop and Issue Draft Permit	Notes
POTWs - Major - Minor	 4,200 10,000	 180 days 180 days	Timelines vary widely dependent on permit significance, public involvement, and consultations
Non-POTW (Industrial) - Major - Minor	 2,500 29,000	 180 days 180 days	Timelines vary widely dependent on permit significance, public involvement, and consultations
Phase I MS4s	1,000	180 days	Timelines vary widely dependent on permit significance, public involvement, and consultations

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B.1 Hazardous Waste, Treatment, Storage, and Disposal Facilities Regulations, 2011 (pages 3-10)

Link - Hazardous Waste Treatment, Storage, and Disposal Facilities Regulations

Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF) Regulations

A User-Friendly Reference Document for RCRA Subtitle C Permit Writers and Permittees

12/1/2014
EPA 530-R-11-006
Version 4

Overview of the Hazardous Waste RCRA Permitting Processes (Flowcharts) – interactive versions of the flowcharts

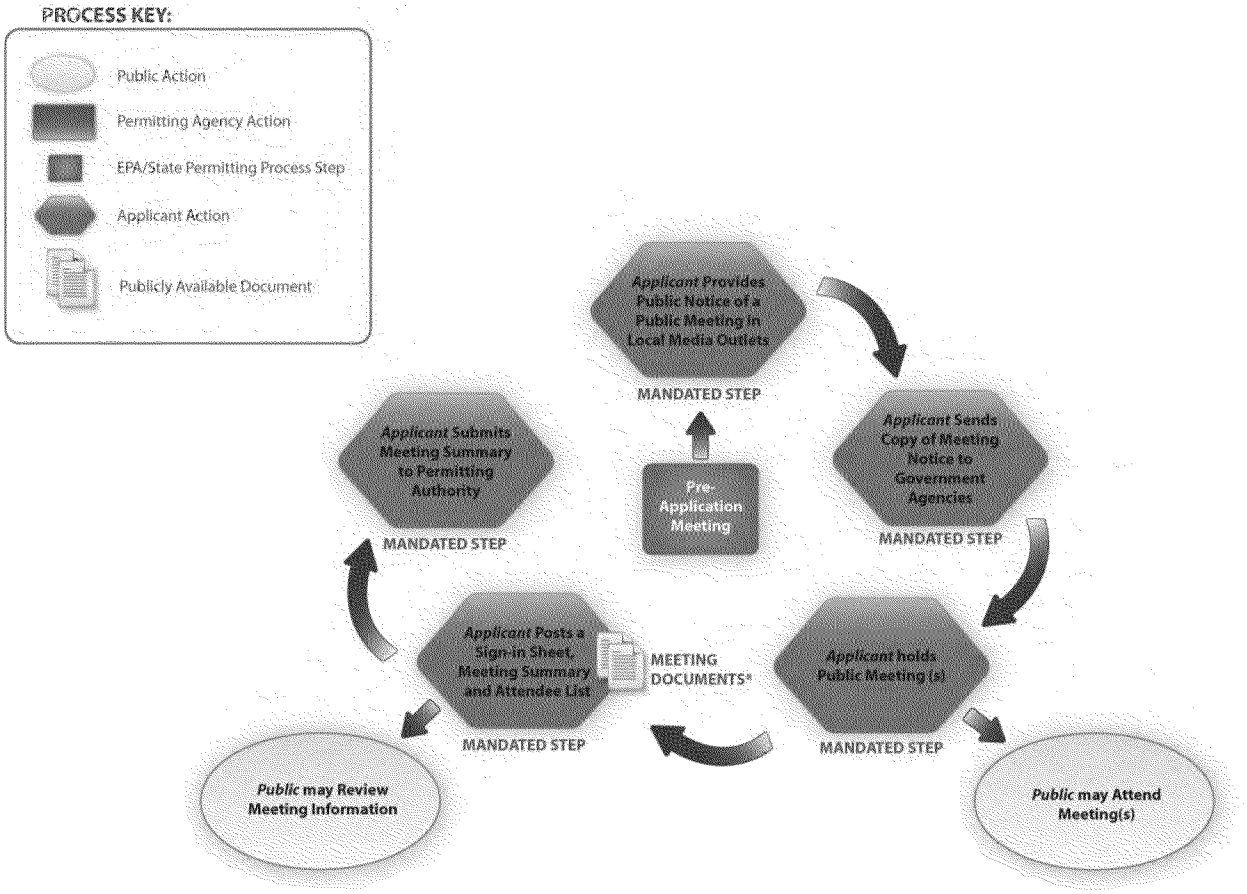
Note: *The following 7 RCRA permitting process flow diagrams that summarize public involvement activities (see the RCRA Public Participation Manual) were released for public comment pursuant to the Office of Solid Waste and Emergency Response (OSWER) Community Engagement Initiative (CEI). Under CEI Action 1, OSWER developed and posted program work plans, which identified specific processes that should be evaluated and potentially revised to enhance public participation.*

OSWER sought public comment on those work plans and on the following RCRA permitting program process diagrams, which were developed to increase transparency of the opportunities for community involvement. The comment period for the work plans and process diagrams ended on July 31, 2011. EPA will assess comments received and, as a result, may modify these process diagrams. If that happens, the following process flow diagrams will be updated accordingly.

Note: *For a short synopsis of the hazardous waste permitting process see The Hazardous Waste Permitting Process: A Citizens Guide, which uses a question and answer format.*

For a more detailed description of the hazardous waste permitting process, see Permit Applicants' Guidance Manual for Hazardous Waste Land Treatment, Storage and Disposal Facilities, Final Draft (PDF, 668 pp, 23MB)

RCRA Hazardous Waste Pre-Permit Application Meeting



Additional Information

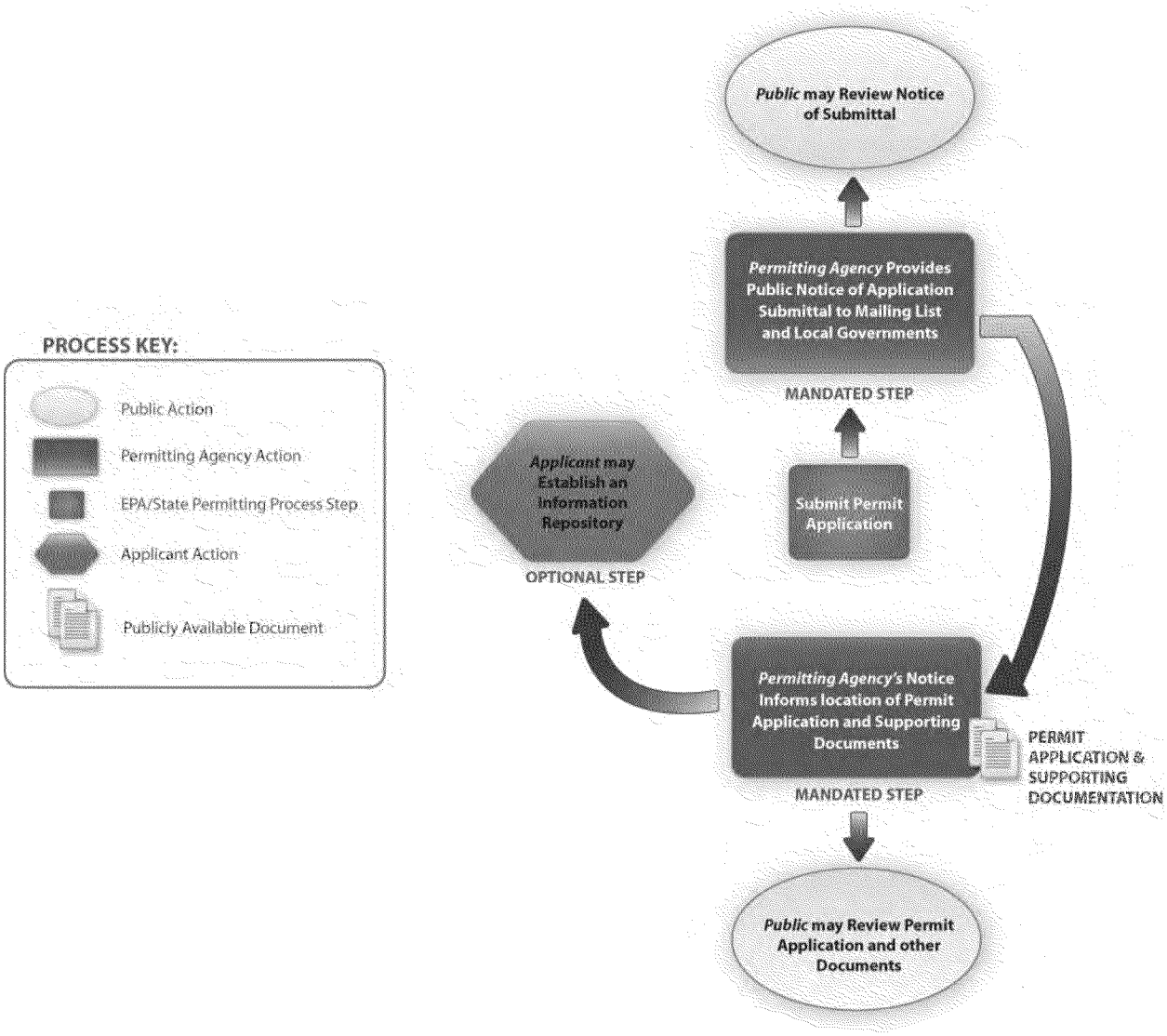
When an applicant announces an upcoming meeting through a public notice, it must include:

- The date, time, and location of the meeting.
- A brief description of the purpose of the meeting .
- A brief description of the facility and proposed operations, including the address or a map of the facility location.
- A statement encouraging people to contact the facility at least 72 hours before the meeting if they need special access to participate in the meeting.
- The name, address, and telephone number of a contact person for the applicant.

*Meeting Documents include: Meeting Summary, Attendee List, Attendee Feedback, and Applicant Responses to Attendee Feedback.

NOTE: This step applies only to RCRA hazardous waste permits for new TSDF facilities and RCRA hazardous waste renewal permits for existing TSDF facilities that undergo significant changes, and does not apply to post-closure or post-closure / corrective action permits.

Submit a RCRA Hazardous Waste Permit Application



Additional Information

When the Permitting Agency announces the permit application submittal, the public notice must include:

- The name and telephone number of the applicant's contact person.
- The name and telephone number of the permitting agency's contact office and a mailing address to which information, opinions, and inquiries may be directed throughout the permit review process.
- An address to which people can write to be put on the facility mailing list.
- The location where copies of the permit application and any supporting documents can be viewed and copied.
- A brief description of the facility and proposed operations, including the address or a map of the facility location on the front page of the notice.
- The date the application was submitted.

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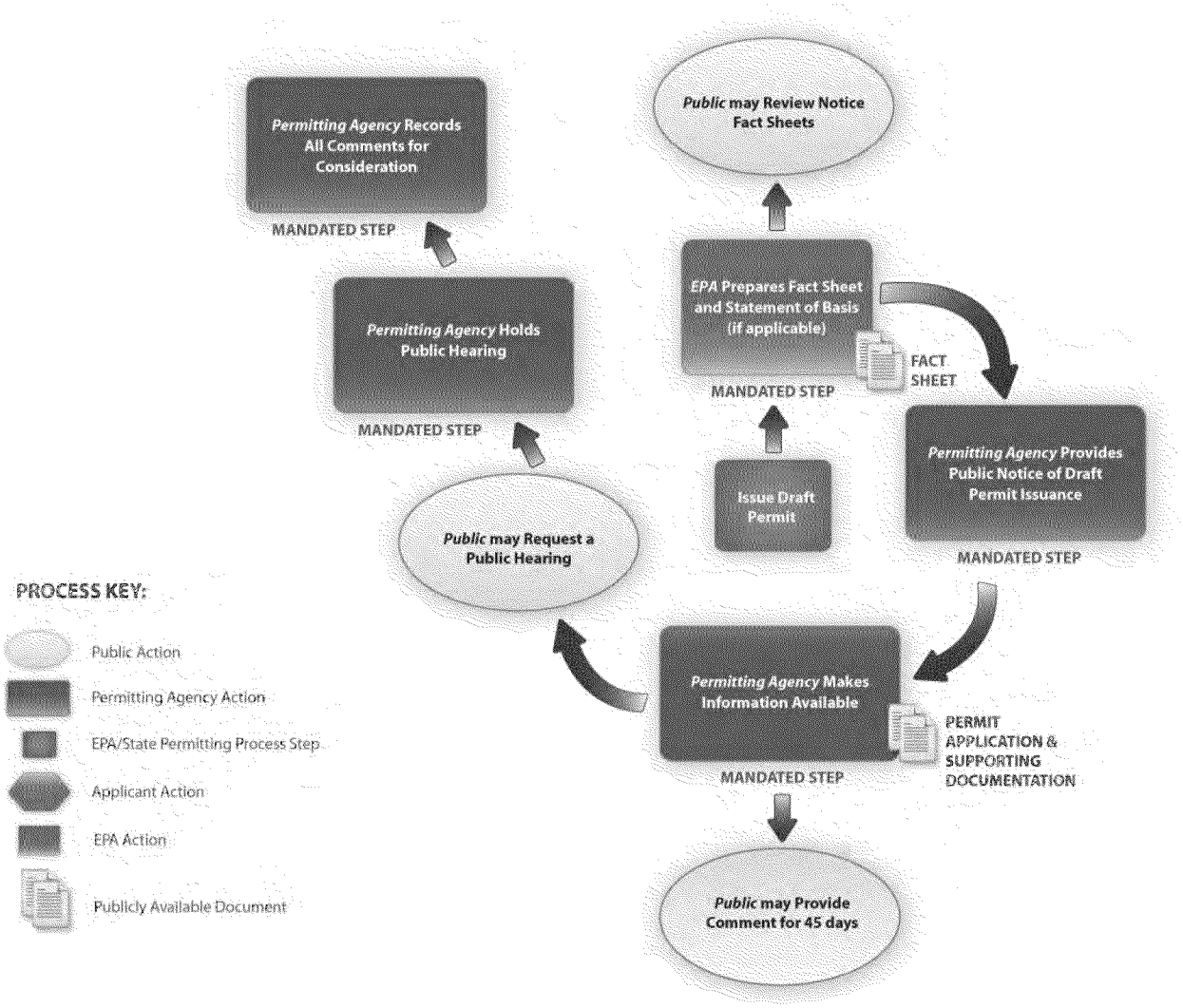
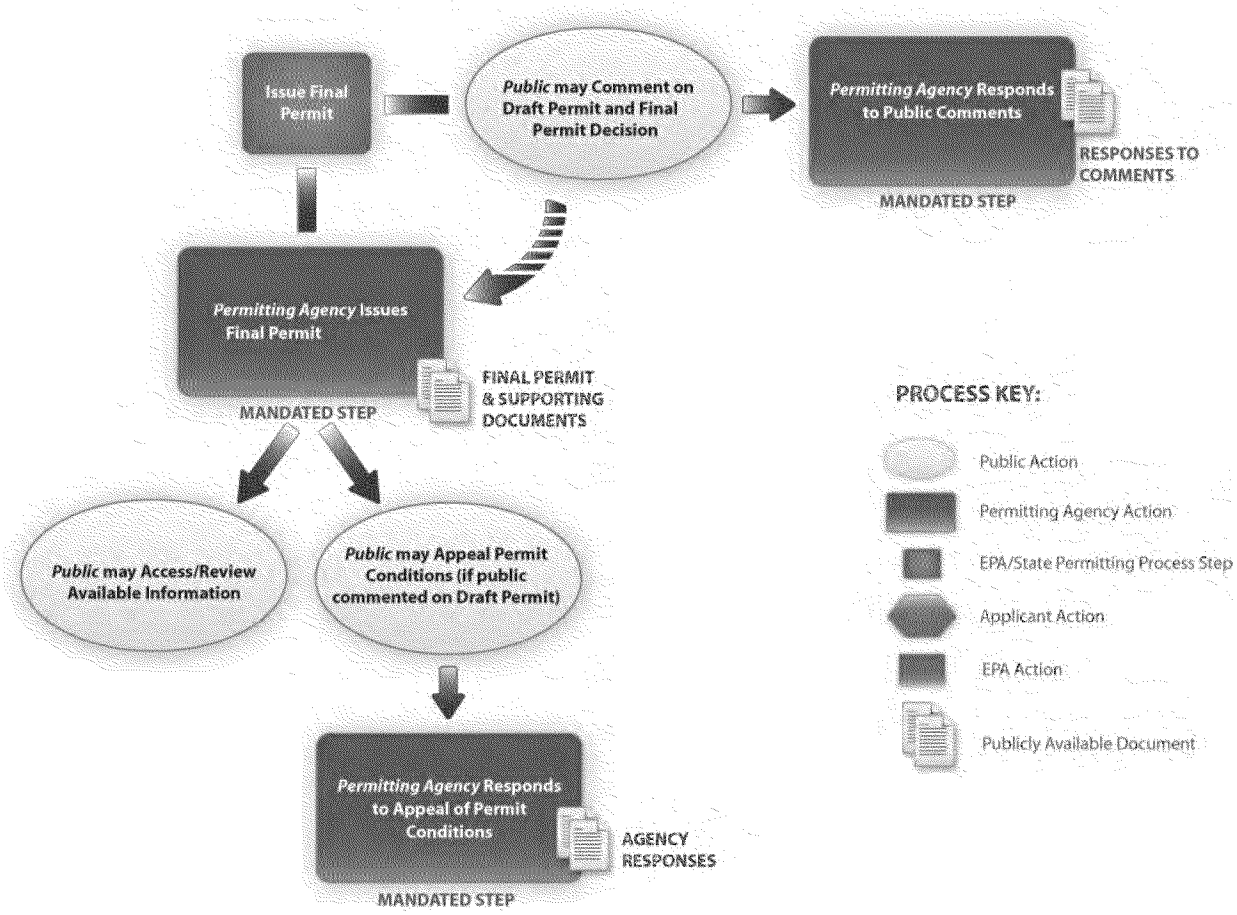
Issue a Draft RCRA Hazardous Waste Permit



Additional Information

- Permitting agencies can keep the process open by sharing all Notice of Deficiency (NOD) information with the public, whether through the administrative record, an information repository, or another activity, such as a workshop.
- Interested community groups or the permit applicant may decide to provide additional public participation activities during this stage. These could include technical discussions to explain the NOD process or informal meetings with the permitting agency.
- The agency, facility, or a public interest group may want to organize an availability session, facility tours, or some other activity prior to the comment period so that the public can be better informed about the facility.

Issue a Final RCRA Hazardous Waste Permit

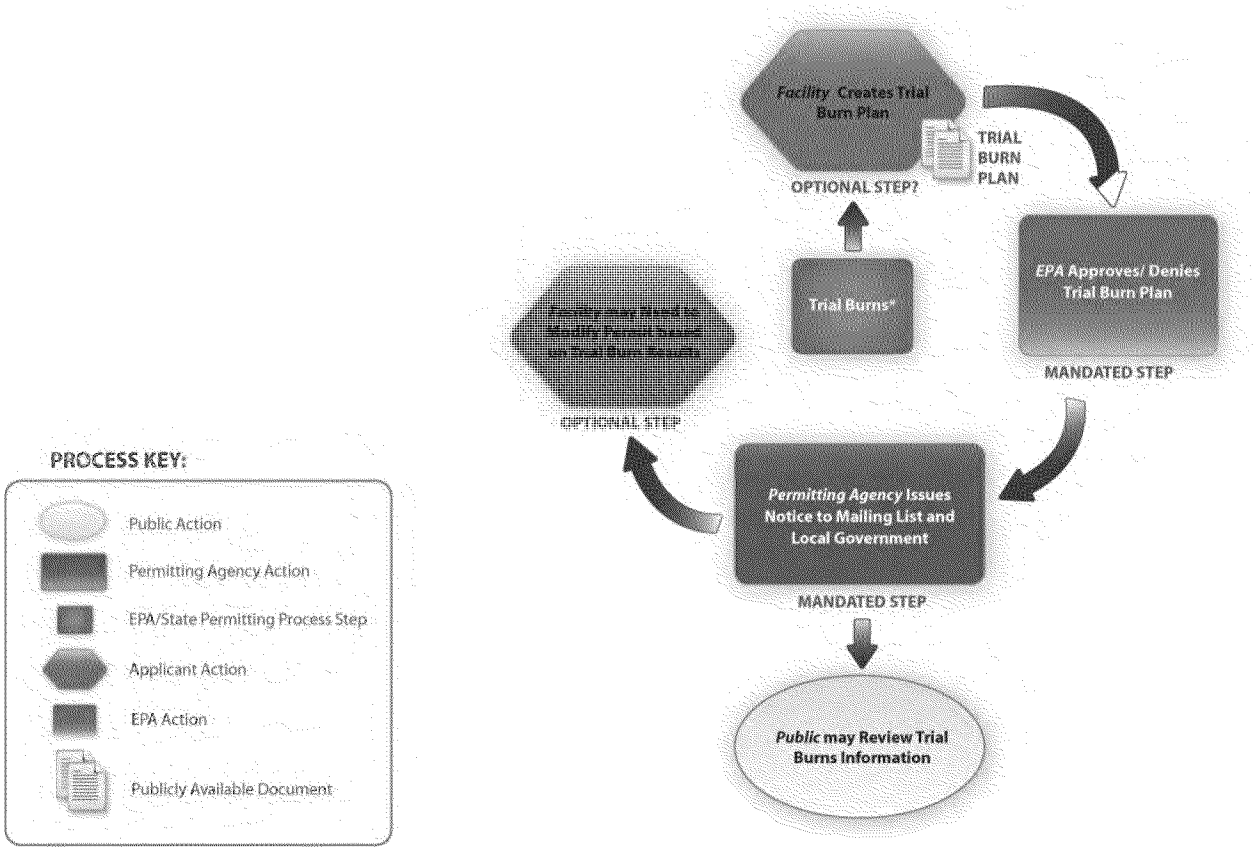


Additional Information

- If there was high interest during the comment period, the agency or the facility may want to issue a news release and fact sheet when the decision is finalized to inform a wide audience.
- The Permitting Agency may choose to update and release the fact sheet required in §124.8.

NOTE: Permitting Agency responses to public comments on the Draft Permit are placed in the Administrative Record and Information Repository.

RCRA Hazardous Waste Combustor Trial Burns



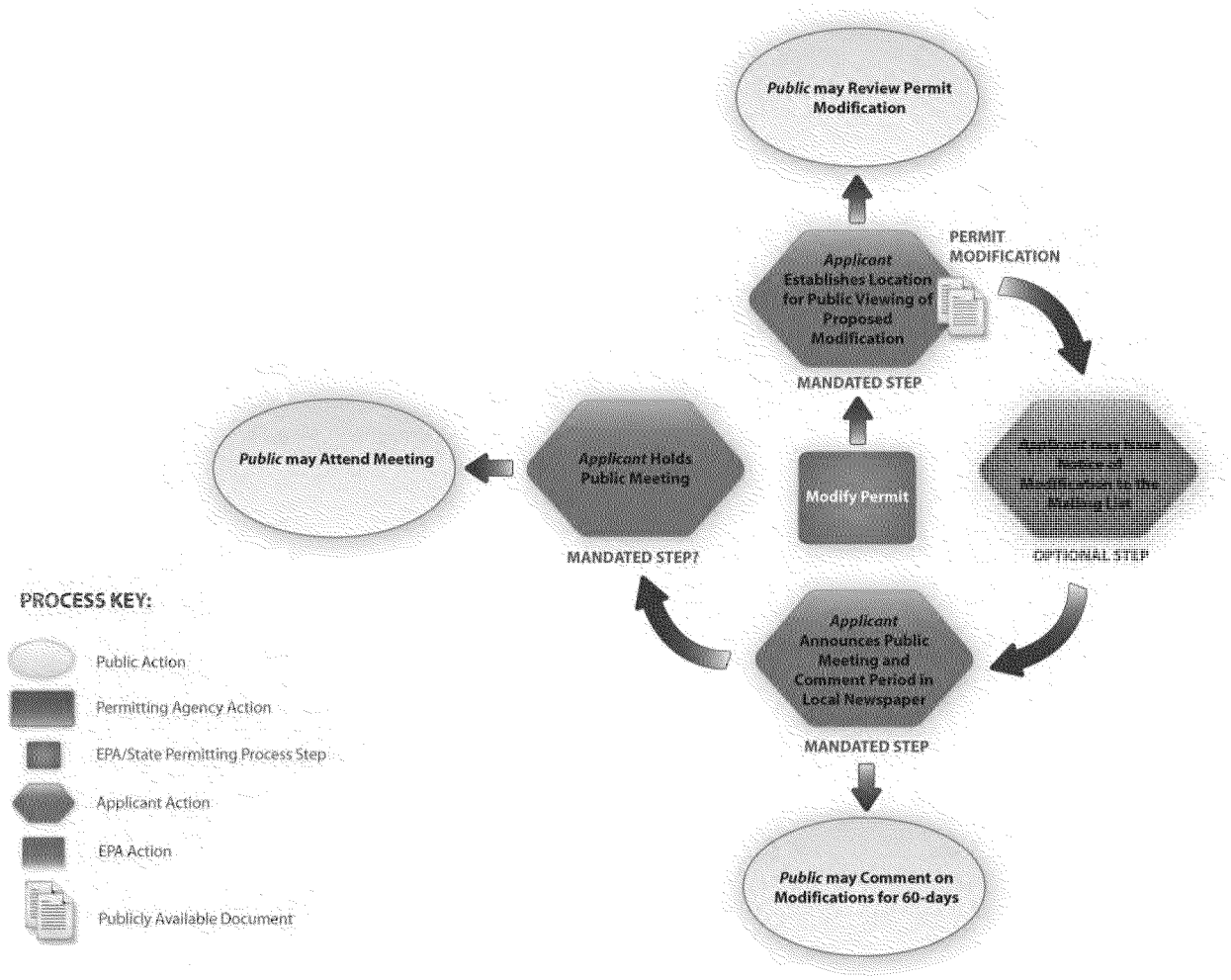
Additional Information

***NOTE:** Emissions from combustion sources burning hazardous waste (e.g., cement kilns, incinerators, lightweight aggregate kilns, boilers and hydrochloric acid production furnaces) are primarily regulated pursuant to Clean Air Act and applicable Title V requirements. However, these combustion sources still need a RCRA permit to operate even after documenting compliance with CAA requirements. The RCRA permit only needs to address basic hazardous waste management including: general facility standards; corrective action; other hazardous waste management units (such as storage units); other combustor-specific concerns such as materials handling; and, any risk-based combustor emission and operating requirements that are more stringent than the relevant MACT standard.

The Clean Air Act title V permit will focus on the operation of the combustion unit including the MACT air emission standards and related operating parameters.

- Maximum Achievable Control Technology (MACT) EEE Test Requirements
- Clean Air Act – Title V Permits

Modify a RCRA Hazardous Waste Permit

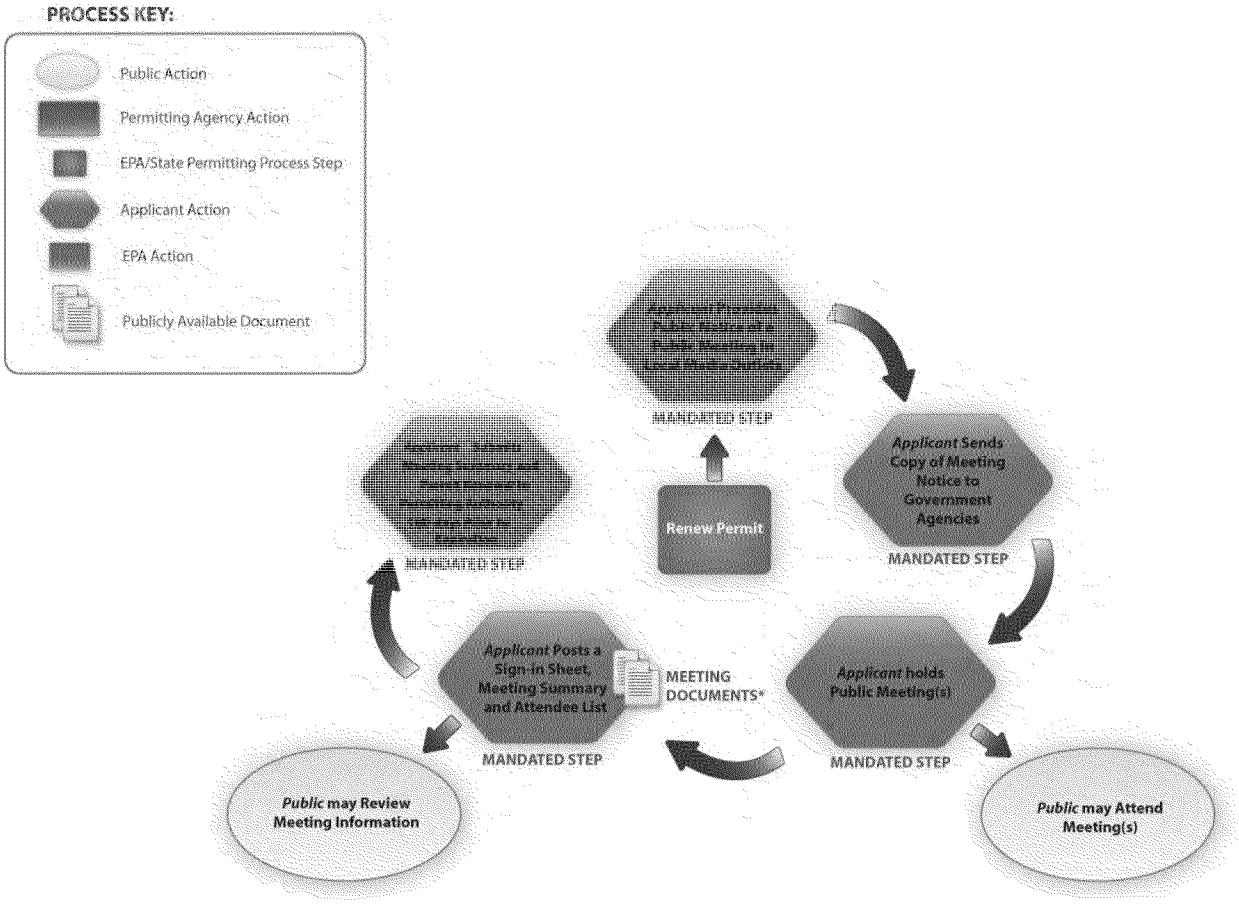


Additional Information

- Facility-initiated modifications are classified as Class 1, 2, or 3 according to the nature of the change.
- More often, facility owners or operators initiate the permit modification, rather than the permitting agency, in order to improve facility operations or make changes in response to new standards.

NOTE: Public Participation steps above are only applicable to Class 2 and Class 3 modifications. For Class 1 Modifications, the Permittee issues notice to the facility mailing list after implementation and anyone has the opportunity to request that the Director review the Class 1 Modification request.

Renew a RCRA Hazardous Waste Permit



Additional Information

Permit Renewal process is similar to issuing a new permit, requiring draft and final permit issuance steps. When an applicant announces an upcoming meeting through a public notice, it must include:

- The date, time, and location of the meeting.
- A brief description of the purpose of the meeting.
- A brief description of the facility and proposed operations, including the address or a map of the facility location.
- A statement encouraging people to contact the facility at least 72 hours before the meeting if they need special access to participate in the meeting.
- The name, address, and telephone number of a contact person for the applicant.

*Meeting Documents include: Meeting Summary, Attendee List, Attendee Feedback, and Applicant Responses to Attendee Feedback

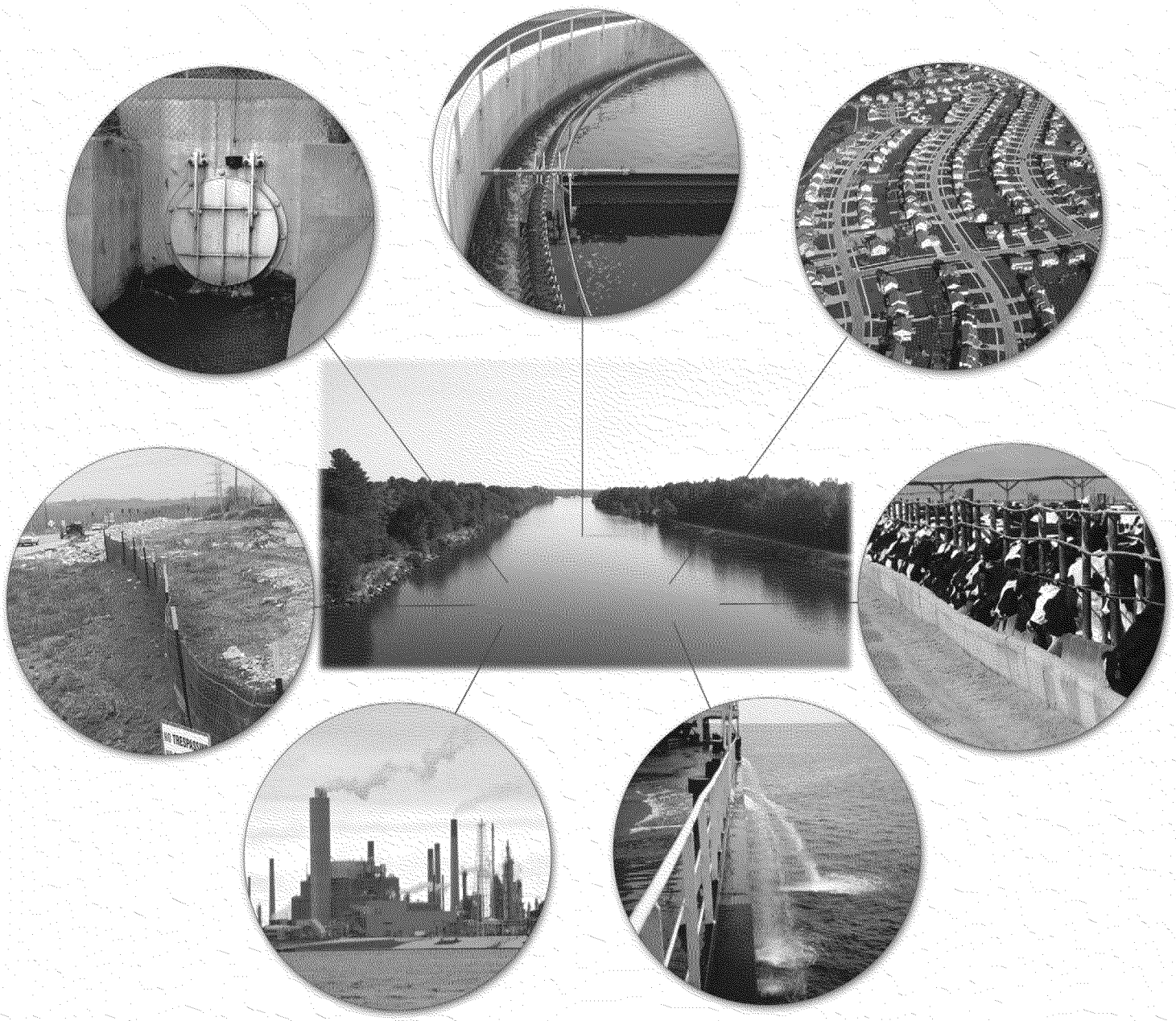
These steps only apply to renewal applications proposing changes that qualify as Class 3 permit modifications.

B.2 NPDES Permit Writers Manual, 2010. (Pages 3-1 to 3-6)

Link - NPDES Permit Writers Manual

U.S. Environmental Protection Agency

NPDES Permit Writers' Manual



U.S. Environmental Protection Agency
Office of Wastewater Management, Water Permits Division
State and Regional Branch

EPA-833-K-10-001 • September 2010

ED_001523_00005090-00122

United States
Environmental Protection
Agency

Office of Water
Washington, DC

United States Environmental Protection Agency

National Pollutant Discharge Elimination System (NPDES) Permit Writers' Manual

This guidance was developed by staff within the U.S. Environmental Protection Agency's (EPA's) Office of Wastewater Management and addresses development of wastewater discharge permits under the National Pollutant Discharge Elimination System (NPDES). NPDES permit development is governed by existing requirements of the Clean Water Act (CWA) and the EPA NPDES implementing regulations. CWA provisions and regulations contain legally binding requirements. This document does not substitute for those provisions or regulations. Recommendations in this guidance are not binding; the permitting authority may consider other approaches consistent with the CWA and EPA regulations. When EPA makes a permitting decision, it will make each decision on a case-by-case basis and will be guided by the applicable requirements of the CWA and implementing regulations, taking into account comments and information presented at that time by interested persons regarding the appropriateness of applying these recommendations to the situation. This guidance incorporates, and does not modify, existing EPA policy and guidance on developing NPDES permits. EPA may change this guidance in the future.

Water Permits Division
Office of Wastewater Management
Washington, DC 20460
(4203)
www.epa.gov/npdes

EPA-833-K-10-001
September 2010

CHAPTER 3. Overview of the NPDES Permitting Process

This chapter presents an overview of the different types of National Pollutant Discharge Elimination System (NPDES) permits, the major permit components, and the permit development and issuance process. The permit process is illustrated by flow charts. The tasks identified within the flow charts are described in detail in subsequent chapters.

3.1 Types of Permits

The two basic types of NPDES permits are individual and general permits. These permit types share the same components but are used under different circumstances and involve different permit issuance processes.

3.1.1 Individual Permits

An individual permit is a permit specifically tailored to an individual facility. Upon receiving the appropriate application form(s), the permitting authority develops a permit for that facility on the basis of information from the permit application and other sources (e.g., previous permit requirements, discharge monitoring reports, technology and water quality standards, total maximum daily loads, ambient water quality data, special studies). The permitting authority then issues the permit to the facility for a specific period not to exceed 5 years, with a requirement to reapply before the expiration date.

3.1.2 General Permits

A permitting authority develops and issues a general permit to cover multiple facilities in a specific category of discharges or of sludge use or disposal practices. General permits can be a cost-effective option for agencies because of the large number of facilities that can be covered under a single permit. According to Title 40 of the *Code of Federal Regulations* (CFR) 122.28(a)(2), general permits may be written to cover stormwater point sources or other categories of point sources having the following common elements:

- Sources that involve the same or substantially similar types of operations.
- Sources that discharge the same types of wastes or engage in the same types of sludge use or disposal.
- Sources that require the same effluent limitations or operating conditions, or standards for sewage sludge use or disposal.
- Sources that require the same monitoring where tiered conditions may be used for minor differences within a class (e.g., size or seasonal activity).
- Sources that are more appropriately regulated by a general permit.

The regulations at § 122.28(a)(1) provide for general permits to cover dischargers within an area corresponding to specific geographic or political boundaries such as the following:

- Designated planning area.
- Sewer district.
- City, county, or state boundary.

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- State highway system.
- Standard metropolitan statistical area.
- Urbanized area.

The regulation also allows a general permit to cover any other appropriate division or combination of such boundaries. For example, EPA has issued general permits that cover multiple states, territories, and tribes where EPA is the permitting authority.

Where a large number of similar facilities require permits, a general permit allows the permitting authority to allocate resources in a more efficient manner and to provide more timely permit coverage than issuing an individual permit to each facility. In addition, using a general permit ensures consistent permit conditions for comparable facilities.

3.2 Major Components of a Permit

All NPDES permits consist, at a minimum, of five sections:

- **Cover Page:** Contains the name and location of the permittee, a statement authorizing the discharge, and a listing of the specific locations for which a discharge is authorized.
- **Effluent Limitations:** The primary mechanism for controlling discharges of pollutants to receiving waters. A permit writer spends the majority of his or her time, when drafting a permit, deriving appropriate effluent limitations on the basis of applicable technology and water quality standards.
- **Monitoring and Reporting Requirements:** Used to characterize wastestreams and receiving waters, evaluate wastewater treatment efficiency, and determine compliance with permit conditions.
- **Special Conditions:** Conditions developed to supplement numeric effluent limitations. Examples include additional monitoring activities, special studies, best management practices (BMPs), and compliance schedules.
- **Standard Conditions:** Pre-established conditions that apply to all NPDES permits and delineate the legal, administrative, and procedural requirements of the NPDES permit.

In addition to the components of the permit, a fact sheet or statement of basis explaining the rationale for permit conditions makes up part of the documentation that supports a draft permit. Section 11.2 of this manual includes additional discussion of permit documentation and the required elements of a fact sheet or statement of basis.

Although the major sections of a permit listed above are part of all permits, the contents of some sections vary depending on the nature of the discharge (e.g., municipal effluent, industrial process wastewater, stormwater, vessel discharges) and whether the permit is issued to an individual facility or to multiple dischargers (i.e., a general permit). Exhibit 3-1 shows the components of a permit and highlights some distinctions between the contents of NPDES permits for municipal (i.e., POTW) and industrial facilities. Permit writers should note that it is common for different permitting authorities to use different names for each section of a permit.

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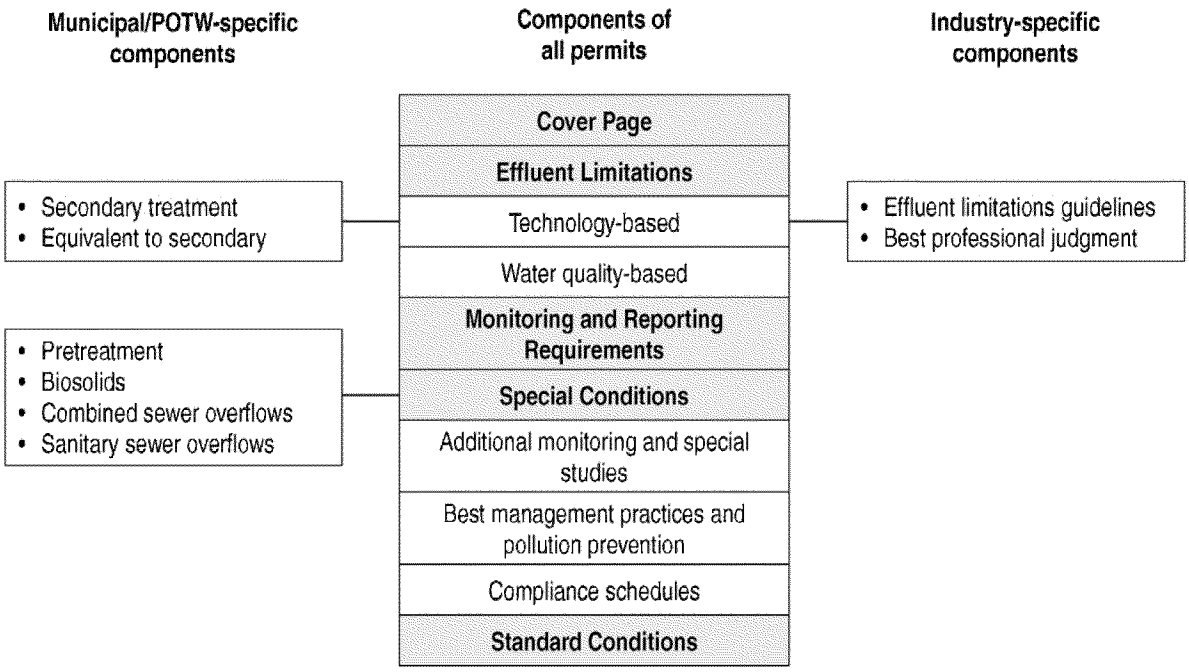
Exhibit 3-1 Permit components



3.3 Overview of the Development and Issuance Process for NPDES Individual Permits

While the limitations and conditions in NPDES individual permits are unique to each permittee, the process used to develop the limitations and conditions and issue each permit generally follows a common set of steps. Exhibit 3-2 illustrates the major steps to develop and issue NPDES individual permits and also serves as an index for the subsequent chapters of this manual by identifying which chapter presents more detailed information on each step.

For individual permits, the permitting process generally begins when a facility operator submits an application. After receiving the application and making a decision to proceed with the permit, the permit writer reviews the application for completeness and accuracy. When the permit writer determines that the application is complete and has any additional information needed to draft the permit, the permit writer develops the draft permit and the justification for the permit conditions (i.e., the fact sheet or statement of basis).

The first major step in the permit development process is deriving technology-based effluent limitations (TBELs). Following that step, the permit writer derives effluent limitations that are protective of state water quality standards (i.e., water quality-based effluent limitations [WQBELs]) as needed. The permit writer then compares the TBELs with the WQBELs and, after conducting an anti-backsliding analysis if necessary, applies the final limitations in the NPDES permit. The permit writer must document the decision-making process for deriving limitations in the permit fact sheet. It is quite possible that a permit will have limitations that are technology-based for some parameters and water quality-based for others. For example, a permit could contain effluent limitations for total suspended solids (TSS) based on national effluent limitations guidelines and standards (effluent guidelines) (technology-based), limitations for ammonia based on preventing toxicity to aquatic life (water quality-based), and limitations for 5-day

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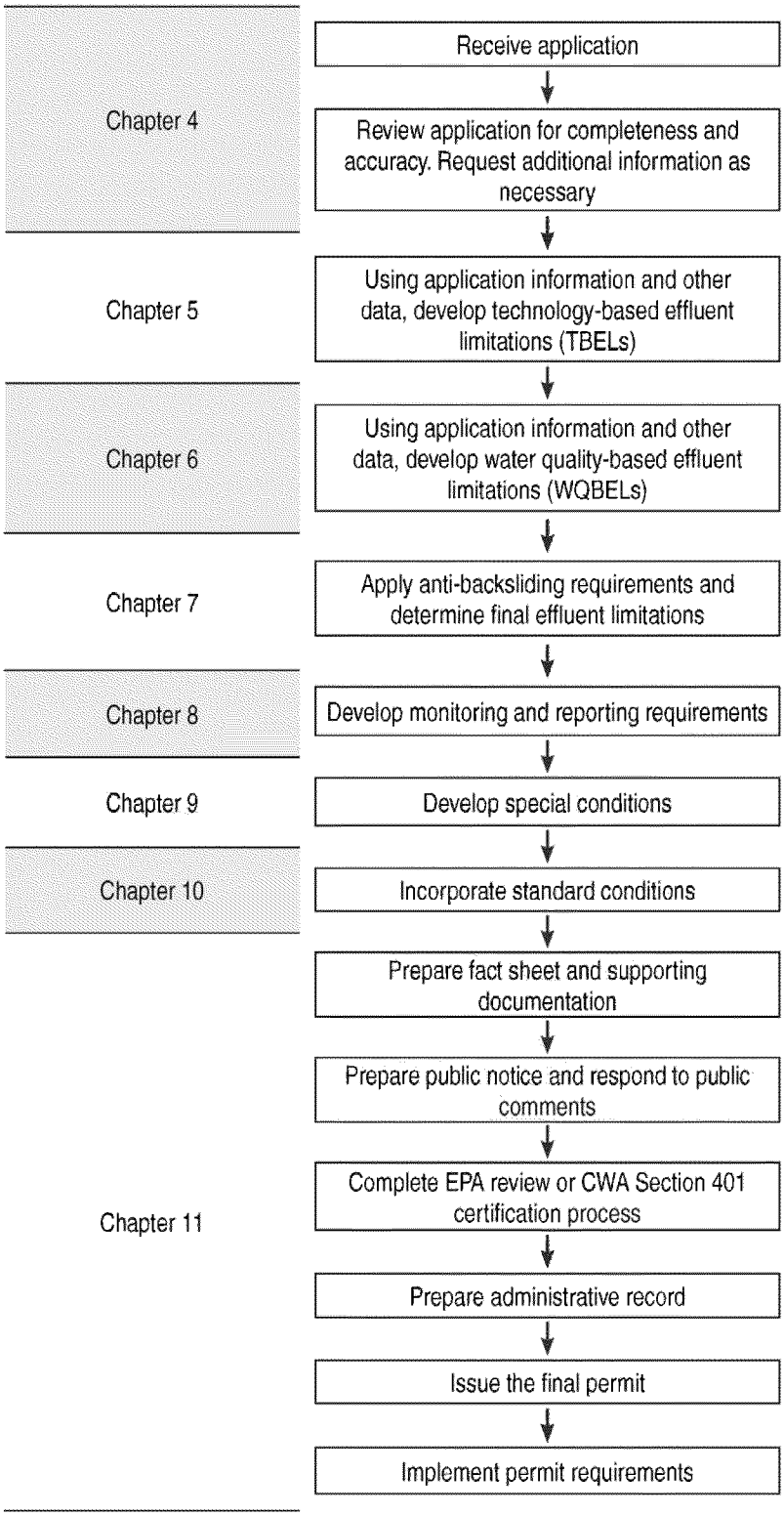
biochemical oxygen demand (BOD_5) that have different bases, such as an average monthly limitation based on effluent guidelines and a maximum daily limitation based on water quality standards.

Exhibit 3-2 Major steps to develop and issue NPDES individual permits



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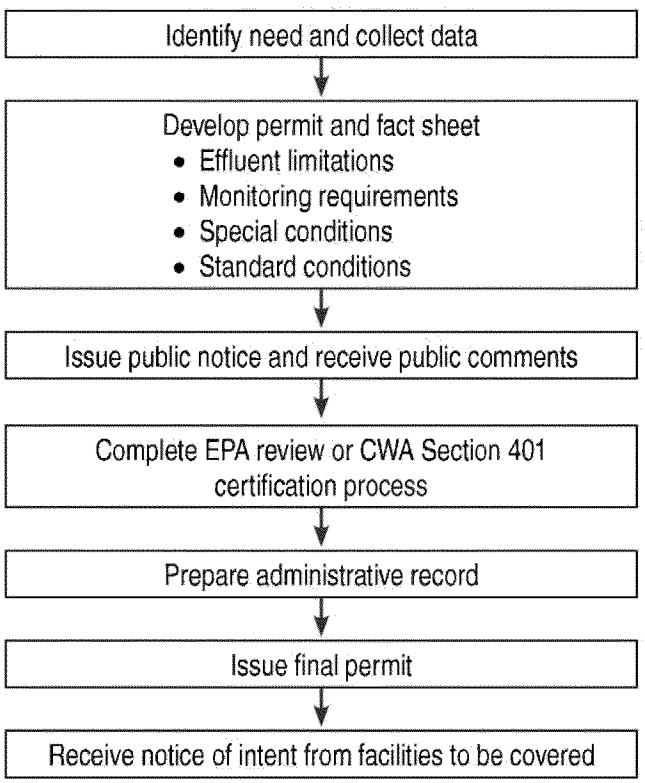
After effluent limitation development, the permit writer develops appropriate monitoring and reporting requirements and facility-specific special conditions. The permit writer then adds standard conditions, which are the same for all permits.

The next step is to provide an opportunity for public participation in the permit process and EPA review of the permit or, in the case of an EPA-issued permit, certification under CWA section 401 by the state with jurisdiction over the receiving water that the permit will comply with its water quality standards. The permitting authority issues a public notice announcing the draft permit and inviting interested parties to submit comments. If there is significant public interest, the permitting authority can hold a public hearing. Taking into consideration the public comments, the permitting authority then produces a final permit, with careful attention to documenting the process and decisions for the administrative record, and issues the final permit to the facility. The permitting authority might decide to make significant changes to the draft permit according to public comment and then provide another opportunity for public review and comment on the revised permit. Section 11.3 of this manual discusses items to address before final permit issuance in more detail.

3.4 Overview of the Development and Issuance Process for NPDES General Permits

The process for developing and issuing NPDES general permits is similar to the process for individual permits; however, there are some differences in the sequence of events. Exhibit 3-3 illustrates the major steps to develop and issue NPDES general permits.

Exhibit 3-3 Major steps to develop and issue NPDES general permits



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For general permits, the permitting authority first identifies the need for a general permit and collects data that demonstrate that a group or category of dischargers has similarities that warrant a general permit. In deciding whether to develop a general permit, permitting authorities consider whether

- A large number of facilities will be covered.
- The facilities have similar production processes or activities.
- The facilities generate similar pollutants.
- Whether uniform WQBELs (where necessary) will appropriately implement water quality standards.

The remaining steps of the permit process are the same as for individual permits. The permitting authority develops a draft permit that includes effluent limitations, monitoring conditions, special conditions, and standard conditions. The permitting authority then issues a public notice and addresses public comments, completes the EPA review or CWA section 401 certification process, develops the administrative record, and issues the final permit. The final permit will also establish the requirements for the specific information that must be submitted by a facility that wishes to be covered under the general permit.

After the final general permit has been issued, facilities that wish to be covered under the general permit typically submit a Notice of Intent (NOI) to the permitting authority. After receiving the NOI, the permitting authority can request additional information describing the facility, notify the facility that it is covered by the general permit, or require the facility to apply for an individual permit.

The following chapters in this manual describe steps in the permitting process in detail. In general, the chapters focus on the steps necessary to develop and issue an individual permit, but much of the technical discussion applies equally to general permit development.

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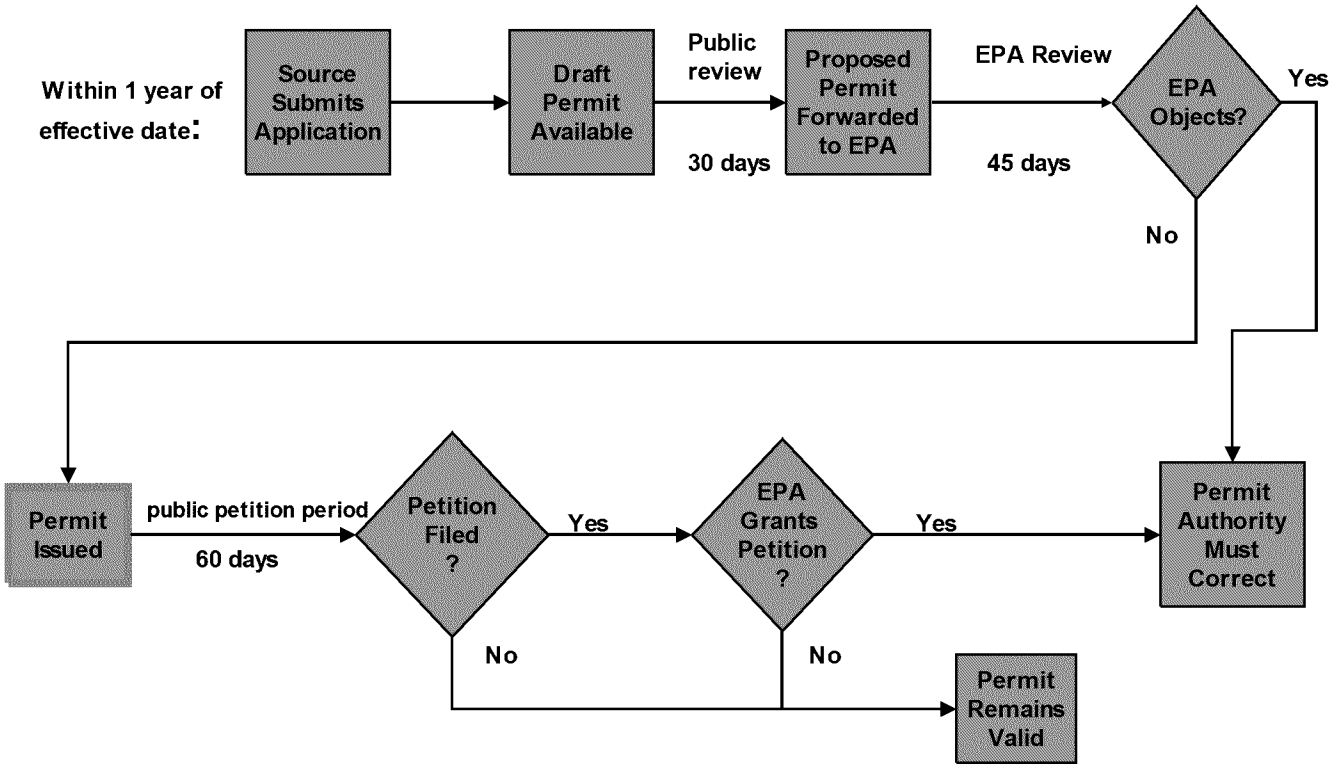
B.3 Clean Air Act – Title V Permit Issuance Timeline

(not available online)

Permit Issuance Timeline



From: Kime, Robin
Location: DCRoomARN3500/OPEI
Importance: Normal
Subject: Meeting with WM Waste Management: Clean Air Act Rules for MSW Landfills
Start Date/Time: Thur 4/13/2017 7:00:00 PM
End Date/Time: Thur 4/13/2017 7:45:00 PM
Letter to EPA Acting Officials - Petition for Reconsideration Enclosed (....pdf
Landfill Air Rules Summary.docx

Directions: Please use the **William Jefferson Clinton North Entrance located on your right as you exit the Federal Triangle Metro Station**. Please arrive 20 minutes prior to the meeting with photo IDs to clear Security.

EPA Contact: For an escort from Security to the meeting call (202) 564-4332; for all other matters call Robin Kime (202)564-6587.

Dear Ms. Dravis and Mr. Sugiyama:

At the suggestion of Al Collins of Occidental Petroleum (Oxy), who met with you last week and now sings your praises, I am writing to request a meeting with you at your earliest convenience to discuss a set of rules promulgated by EPA pursuant to Section 111 (b) and (d) of the Clean Air Act that impose revised performance standards for both new and existing municipal solid waste (MSW) landfills. The regulations were promulgated as part of President Obama's *Climate Action Plan: Strategy to Reduce Methane Emissions*.

Waste Management, along with Republic Services, the National Waste & Recycling Association and the Solid Waste Association of North America (associations representing both public and private organizations and professionals) identified a number of substantial issues of law and policy with the new rules, including overlap and conflict with existing rules governing the same landfill sources. We have asked EPA to stay, reconsider and revise the two climate-related rules. We petitioners have also challenged the new rules in the U.S. Court of Appeals for the D.C. Circuit.

The landfill rules share similarities with other regulations that EPA may reevaluate, including the Clean Power Plan and Oil & Gas Rules:

•□□□□□□□ The new rule for existing landfills relies on the same Section 111(d) authority for which the Clean Power Plan has been criticized; and

•□□□□□□□ The cost/benefit analyses underpinning the more stringent performance standards in the rules rely heavily on the "social cost of methane," which is derived from the "social cost of carbon."

Should the Agency decide to rethink those elements in other rules, we believe it would be advisable to reconsider the landfill rules as well. Although we petitioners are prepared to move forward with the judicial challenge, we believe a reconsideration of the rules could lead to a better outcome without the need for litigation. While rule revisions are our ultimate goal, an administrative stay of the rules under the Administrative Procedures Act is critical to avoid forcing the regulated community and the states to begin implementing these flawed rules. Many states are already engaged in developing their mandated state plans for implementation, which are due to the EPA by May 30, so our request for a meeting is time-critical.

I am attaching a recent letter we petitioners sent to EPA prior to Administrator Pruitt's confirmation. It includes our somewhat lengthy administrative petitions. I would be happy to follow-up next week by phone to identify a convenient time on your doubtless busy schedules. Several participants will be coming from out of town, including a former colleague of Mr. Sugiyama, Mack McGuffey of Troutman Sanders, but we can be flexible in accommodating your schedules.

Thank you in advance, and I very much look forward to meeting you.

Kerry Kelly

Contact:

Kerry Kelly KKelly5@wm.com

Waste Management

701 Pennsylvania Ave., NW, #590

Washington, DC 20004

202.639.1218

New Source Performance Standards & Emission Guidelines for MSW Landfills

Concerns:

- Municipal solid waste (MSW) landfills have successfully reduced landfill emissions over two decades under New Source Performance Standards (Subpart WWW) and Emission Guidelines (Subpart Cc) issued pursuant to Section 111 of the Clean Air Act. In August, 2016, EPA finalized new MSW landfill rules (Subparts XXX & Cf) imposing more stringent regulatory requirements—requiring the installation of gas collection and control systems (GCCS) at a lower non-methane organic compound (NMOC) emission threshold (34 Mg/yr. vs. 50 Mg/yr.).
- EPA's only basis for imposing more stringent requirements was President Obama's Climate Action Plan—EPA admitted that the "best system of emission reduction" for MSW Landfills has not changed (*i.e.*, a well-designed and operated GCCS with 98% NMOC control efficiency), and EPA's benefit analysis relied solely on "climate benefits" calculated using the "social costs" of methane and carbon dioxide.
- EPA's decision to increase the stringency of the Section 111(d) Emission Guidelines (via Subpart Cf) is unprecedented and inconsistent with the Clean Air Act.
- EPA adopted the new rules in new subparts without revising or replacing the old rules. In addition, the same sources are subject to the NESHAP for landfills (Subpart AAAA), which also requires compliance with the old rules. Despite requests for clarification, the Agency has taken the position that affected landfills are now subject to <u>both</u> the old and new rules, unlike any other source category. This result has caused significant confusion and eliminates the potential benefit of the regulatory improvements that EPA intended to make.
- **Time is of the essence for EPA to stay these flawed rules while initiating a remedial rulemaking process.** Under new Subpart Cf, states must submit state plans to EPA by May 30th, and many states have initiated efforts to revise their state regulations in preparation for meeting that deadline. We are already facing potential compliance risks under the new Subpart XXX associated with surprising regulatory interpretations emerging from the Regions that are inconsistent with the regulatory text.

Solutions:

- To avoid unnecessary litigation, to allow states to cease their implementation efforts, and to provide certainty to landfills already subject to the NSPS (Subpart XXX), EPA should immediately stay the new landfill rules (the old rules remain in effect). In a petition to EPA, the waste industry has requested an APA § 705 stay pending judicial review, based on the four relevant factors. **However, as an interim measure, EPA should impose a 90-day CAA § 307 stay pending reconsideration.**
- On the books now are four rules—two Section 111(b) NSPS and two Section 111(d) emission guidelines—where only one of each should exist. These circumstances present two opportunities for deregulatory actions: for example, cost reductions achieved through needed rule revisions to the original Subpart WWW; and the potential to eliminate two regulations (e.g., Subparts XXX and Cf) that can offset another EPA rule.

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- Review of these landfill rules is also required under Executive Order 13777 because they are "significant regulatory actions" that "impose costs that exceed benefits," "create a serious inconsistency," and "derive from or implement … Presidential directives that have been subsequently rescinded or substantially modified."

Critical Actions Needed:

- Issue a letter indicating intent to grant, at least in part, the industry's administrative petition for reconsideration, rulemaking, and stay.
- Provide Fed. Reg. notice of reconsideration and 90-day stay of Subparts XXX and Cf pending reconsideration pursuant to Clean Air Act Section 307(d), 42 U.S.C. § 7607(d).
- Schedule a meeting among landfill sector representatives (Waste Management, Republic Services, NWRA, SWANA) and EPA policymakers to discuss concerns and solutions.
- Inform the States that implementation of the Subpart Cf emission guidelines should await further revisions of the rules.
- Inform the EPA Regions of the intent to stay the new landfill air rules to avoid confusion.

Questions & Answers:

Q: Would a simple repeal of Subparts XXX and Cf resolve the waste industry's concerns?

A. No. A simple repeal of Subparts XXX and Cf would leave the original NSPS and emission guidelines in place, which EPA and the waste industry have long agreed are deficient in many important respects. Since 2002, EPA and the waste industry worked closely to resolve the many ambiguous, unnecessary, or inefficient provisions of Subpart WWW, which in the past have led to significant confusion and unreasonable enforcement risk. Many of the concepts identified in the rulemaking process and proposed by EPA in the <u>proposed</u> Subparts XXX and Cf must be incorporated into Subpart WWW as part of any repeal of those new subparts.

Q What is the regulated pollutant for the MSW Landfill NSPS and Emission Guidelines?

A: The regulated pollutant under both the MSW Landfill NSPS and Emission Guidelines is landfill gas (LFG), with NMOC as the relevant surrogate. In its proposed Emission Guidelines, EPA explained:

> LFG is a collection of air pollutants, including methane and NMOC. LFG is typically composed of 50-percent methane, 50-percent CO2, and less than 1-percent NMOC by volume. The NMOC portion of LFG can contain various organic HAP and VOC. When the Emission Guidelines and NSPS were promulgated in 1996, NMOC was selected as a surrogate for MSW LFG emissions because NMOC contains the air pollutants that at that time were of most concern due to their adverse effects on health and welfare. Today, methane's effects on climate change are also considered important. 80 FR at 52105.

Q: Are these rules required by the Clean Air Act?

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A: No. The CAA requires a review of NSPS every eight years, so a review of the landfill NSPS—originally adopted in 1996—was overdue. To resolve a "sue-and-settle" deadline suit filed by the Environmental Defense Fund (EDF), EPA entered a consent decree requiring it to review the NSPS and make revisions if needed, or explain why a review would not be appropriate. However, nothing in that consent decree required EPA to use the landfill rules to make climate policy, and the consent decree contained absolutely no requirements whatsoever for the emission guidelines.

Q: What are the relevant deadlines for these rules?

A. For the NSPS, the new requirements are already effective and applicable to facilities that commenced construction on a "modification" (defined for landfills as a vertical or horizontal expansion) after July 17, 2014. Although the NSPS is written much like the original NSPS, in a way that allows up to 30 months to satisfy all requirements, some states and EPA regions have interpreted the NSPS to apply much sooner for landfills that already have a GCCS installed voluntarily or to comply with the original NSPS. For example, in a recent email to Florida Department of Environmental Protection, EPA Region 4 indicated that the first annual report demonstrating compliance with Subpart XXX is due April 26, 2017.

For the emission guidelines, States must submit their Subpart Cf state plans to EPA by May 30, 2017, and EPA must then approve or disapprove those plans within four months.

In the litigation, the parties must submit proposed briefing schedules and formats by March 31, 2017, or request an extension of the deadline by March 27, 2017.

Q: Are the same sources subject to a NESHAP?

A. Yes, Subpart AAAA of Part 63 imposes a NESHAP on MSW landfills and, with very few additional provisions, simply requires compliance with Subpart WWW or Cc. Since Subpart AAAA was not revised as part of EPA's rulemaking last year, it continues to require compliance with the old rules, without any reference to the new rules that are now effective.

Q: What is required to initiate an immediate stay under § 307 of the CAA?

A: EPA may issue an administrative stay of a rule for which EPA has granted a petition for reconsideration for a period not to exceed three months. EPA does not need to provide justification for a stay pursuant to the Agency's CAA authority so long as the Agency has convened a proceeding for reconsideration of the rule. EPA can accomplish the stay by either writing a letter indicating the Agency's intent to convene a reconsideration proceeding and subsequently noticing EPA's intent to stay in the Federal Register, or by issuing a simultaneous notice of intent to stay and reconsider the rules in the Federal Register.

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National Waste & Recycling Association℠
Collect. Recycle. Innovate.

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SOLID WASTE ASSOCIATION of North America

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WASTE MANAGEMENT

REPUBLIC SERVICES

January 30, 2017

Via Overnight Mail

The Honorable Catherine McCabe
Acting Administrator
United States Environmental Protection Agency
Office of the Administrator, Mail Code 1101A
1200 Pennsylvania Avenue, N. W.
Washington, DC 20460

Sarah Dunham
Acting Assistant Administrator
United States Environmental Protection Agency
Office of Air and Radiation, Mail Code 6101A
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Kevin Minoli
Acting General Counsel
United States Environmental Protection Agency
Office of General Counsel
1200 Pennsylvania Avenue, N.W.
WJC North Building, Suite 4000
Washington, DC 20460

RE: Pending Petition for Administrative Reconsideration, Rulemaking, and Stay of the Landfill New Source Performance Standards and Emission Guidelines

Dear Ms. McCabe, Ms. Dunham, and Mr. Minoli,

On October 27, 2016, representatives of the waste management sector (both public and private organizations) asked EPA to reconsider, revise, and stay two climate change related rules promulgated

by EPA pursuant to Section 111 of the Clean Air Act that impose revised performance standards on both new and existing municipal solid waste landfills respectively entitled, "*Standards of Performance for Municipal Solid Waste Landfills*," 81 Fed. Reg. 59332-59384 (Aug. 29, 2016), and "*Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills*," 81 Fed. Reg. 59276-59330 (Aug. 29, 2016). Both regulations were promulgated as part of President Obama's *Climate Action Plan: Strategy to Reduce Methane Emissions*.

Because we have not received any response from EPA on the petition to date, and in recognition of the recent change in leadership at EPA, we have enclosed the petition for your review. As you will note, the petition identifies numerous and substantial questions of law and policy with the new rules, including the way the rules overlap and conflict with existing rules governing the source category.

We also wanted to draw your attention to similarities that these landfill rules share with other regulations that EPA may reevaluate, in particular EPA's Clean Power Plan and Oil & Gas Rules. For example, the cost-benefit analysis underpinning the landfill rules heavily relies on EPA's "social cost of methane" framework (derived from the Agency's "social cost of carbon" framework) that has been the subject of much debate and criticism. In addition, EPA's new rule for existing landfills relies on the same Section 111(d) authority for which EPA has been heavily criticized in the context of the Clean Power Plan. To the extent that EPA decides to discontinue the Agency's use of the "social cost of methane" or follows a more restrained interpretation of its Section 111(d) authority, EPA should likewise reconsider the landfill rules cited above.

In addition to filing the enclosed administrative petition with the Agency, the petitioners have challenged the new landfill rules in the U.S. Court of Appeals for the D.C. Circuit, and the parties will shortly need to propose a briefing schedule to the Court. Although the petitioners are prepared to proceed with the judicial challenge, we believe that a reconsideration of the rules could lead to an appropriate outcome without the need for litigation. Therefore, we request that EPA grant the enclosed petition and work with the waste management sector to develop a revised rule.

As set forth in the enclosed petition, the petitioners request that EPA issue an administrative stay of the rules using its authority under the Administrative Procedure Act. Although rule revisions are our ultimate goal, a stay is critical to avoid forcing the regulated community and states across the country to begin the process of implementing a set of rules that may ultimately change, which would result in a significant waste of resources. Such a stay would therefore be a particularly cost-effective administrative step, and would also be consistent with the January 20, 2017 directive from Reince Priebus, Assistant to the President and White House Chief of Staff, that all agency and department heads consider proposing for notice and comment a rule to delay the effectiveness of regulations presenting substantial questions of law or policy.

We recognize that many tasks will demand your attention in this time of transition, but hope you will recognize the need for swift action in this case. Fortunately, EPA can quickly and easily eliminate the time pressure with respect to the landfill performance standards by granting the enclosed

petition. Should you have any questions regarding this correspondence, please contact any of the undersigned at your convenience.

Respectfully submitted,

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PETITION FOR RULEMAKING, RECONSIDERATION, AND ADMINISTRATIVE STAY

DOCKET I.D. EPA-HQ-OAR-2003-0215; EPA-HQ-OAR-2014-0451

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Appendix A

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I. Introduction

On August 29, 2016, the Environmental Protection Agency ("EPA" or "Agency") promulgated final rules entitled, *Standards of Performance for Municipal Solid Waste Landfills*, 81 Fed. Reg. 59332-59384 (Aug. 29, 2016) ("Subpart XXX"), and *Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills*, 81 Fed. Reg. 59276-59330 (Aug. 29, 2016) ("Subpart Cf") (collectively referred to as the "Final Rules"). Prior to publication of the Final Rules, EPA issued the following notices of proposed rulemaking: *Standards of Performance for Municipal Solid Waste Landfills*, 79 Fed. Reg. 41795-41843 (July 17, 2014) and *Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills; Advanced Notice of Proposed Rulemaking*, 79 Fed. Reg. 41771-41793 (July 17, 2014) (collectively referred to as "2014 Proposal"). A year later, EPA issued supplemental proposals, entitled *Standards of Performance for Municipal Solid Waste Landfills*, 80 Fed. Reg. 52162-52168 (Aug. 27, 2015) and *Emission Guidelines, Compliance Times, and Standards of Performance for Municipal Solid Waste Landfills; Proposed Rule*, 80 Fed. Reg. 52100-52162 (Aug. 27, 2016) (collectively referred to as "2015 Supplemental Proposal"). The Final Rules are intended to update existing rules regulating municipal solid waste ("MSW") landfills – the Standards of Performance for Municipal Solid Waste Landfills at 40 C.F.R. Part 60, Subpart WWW ("Subpart WWW") and the Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills at 40 C.F.R. Part 60, Subpart Cc ("Subpart Cc").

Pursuant to Section 553(e) of the Administrative Procedure Act ("APA"), 5 U.S.C. § 553(e), the National Waste & Recycling Association, the Solid Waste Association of North America, Republic Services, Inc., Waste Management, Inc., and Waste Management Disposal Services of Pennsylvania, Inc. (collectively referred to as "Petitioners") request that EPA

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immediately undertake a rulemaking to revise the Final Rules, as further specified in Section III, below. Additionally, pursuant to Section 307(d)(7)(B) of the Clean Air Act, 42 U.S.C. § 7607(d)(7)(B) ("CAA" or "Act"), Petitioners request that EPA reconsider certain aspects of the Final Rules, as set forth in Section IV, below. Finally, Petitioners request that EPA immediately grant Petitioners' request for administrative stay of the Final Rules, as more fully detailed in Section V, below, in order to suspend the effectiveness of the Final Rules and to allow the Agency time to correct the significant substantive and procedural flaws identified in this Petition.

II. Petitioners' Background

The National Waste & Recycling Association ("NWRA") is a trade association that represents private-sector waste and recycling companies in the United States, and manufacturers and service providers who do business with those companies. NWRA's members operate in all 50 states and the District of Columbia. NWRA provides leadership, education, research, advocacy, and safety expertise to promote North American waste and recycling industries, serve as their voice, and create a climate where members prosper and provide safe, economically sustainable, and environmentally sound services.

The Solid Waste Association of North America ("SWANA") is a California nonprofit public benefit corporation. Its membership includes more than 8,500 public and private sector professionals committed to advancing from solid waste management to resource management through their shared emphasis on education, advocacy and research. For more than 50 years, SWANA has been the leading professional association in the solid waste management field.

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Republic Services, Inc.[1] ("Republic") serves residential, municipal, commercial, and industrial customers nationwide and is dedicated to providing dependable solutions for recycling and waste challenges. Republic provides reliable service through 340 collection operations, 201 transfer stations, 193 active landfills, 67 recycling centers, eight treatment, recovery and disposal facilities, 12 salt water disposal wells, and 69 landfill gas and renewable energy projects across 41 states and Puerto Rico. Republic maintains approximately 125 closed MSW landfills. Republic is a holding company and all operations are conducted by its subsidiaries.

Waste Management, Inc.[2] ("WM") is North America's leading provider of integrated waste management and environmental solutions. Through its network of subsidiaries, including Waste Management Disposal Services of Pennsylvania, Inc., WM operates 244 active, solid waste landfills, and at 136 of them, operates beneficial landfill-gas-to energy ("LFGTE") projects. These projects produce renewable electricity, renewable fuel for stationary facilities, and renewable transportation fuel for vehicles, including about 1000 of WM's own refuse collection trucks. WM maintains approximately 200 closed MSW landfills.

Petitioners have engaged with EPA during the rulemaking period and submitted comments on both the 2014 Proposal and 2015 Supplemental Proposal. *See* NWRA & SWANA, Comments on 2014 Proposal, Docket ID EPA-HQ-OAR-2003-0215-0108 & EPA-HQ-OAR-2014-0451-0062 ("NWRA & SWANA 2014 Comments"); NWRA & SWANA, Comments on 2015 Supplemental Proposal, Docket ID EPA-HQ-OAR-2003-0215-0196 & EPA-HQ-OAR-2014-0451-0186 ("NWRA & SWANA 2015 Comments"); Republic Services, Comments on

[1] Republic Services, Inc. is a holding company and all operations are conducted by its wholly-owned and majority-owned subsidiaries. This Petition is being filed by Republic Services, Inc. on behalf of these consolidated subsidiaries (collectively "Republic").

[2] Waste Management, Inc., a Delaware Corporation, is a holding company and all operations are conducted by its wholly-owned and majority-owned subsidiaries. This Petition is being filed by Waste Management, Inc. on behalf of these consolidated subsidiaries (collectively "Waste Management" or "WM").

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Proposed Standards of Performance for Municipal Solid Waste Landfills, Docket ID EPA-HQ-OAR-2003-0215-0099 ("Republic 2014 NSPS Comments"); Republic Services, Comments on Supplemental Proposal – Standards of Performance for Municipal Solid Waste Landfills, Docket ID EPA-HQ-OAR-2003-0215-0202 ("Republic 2015 NSPS Comments"); Republic Services, Comments on the Advanced Notice of Proposed Ruling Making for Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills, Docket ID EPA-HQ-OAR-2014-0451-0061 ("Republic 2014 EG Comments"); Republic Services, Comments on Proposed Rules; Emission Guidelines, Compliance Times, and Standards of Performance for Municipal Solid Waste Landfills, Docket ID EPA-HQ-OAR-2014-0451-0176 ("Republic 2015 EG Comments"); Waste Management, Inc., Comments on 2014 Proposal, Docket ID EPA-HQ-OAR-2003-0215-0100 & ("WM 2014 Comments"); Waste Management, Inc., Comments on 2015 Supplemental Proposal, Docket ID EPA-HQ-OAR-2003-0215-0198 & EPA-HQ-OAR-2014-0451-0192 ("WM 2015 Comments"). Additionally, WM, Republic, and other industry stakeholders have provided supplemental information relating to implementation of Subparts WWW and Cc, which can be found in the docket for Subpart XXX at the following Docket ID numbers: EPA-HQ-OAR-2003-0215-0003, EPA-HQ-OAR-2003-0215-0007, EPA-HQ-OAR-2003-0215-0053, EPA-HQ-OAR-2003-0215-0055, EPA-HQ-OAR-2003-0215-0057, EPA-HQ-OAR-2003-0215-0058.

III. Petition for Rulemaking

Petitioners ask EPA to initiate rulemaking to address certain aspects of EPA's Final Rules that were raised in comments at proposal. Under Section 553(e) of the APA, any party can ask any agency to issue, amend, or repeal a rule. 5 U.S.C. § 553(e). Although Section 307(d) of the CAA states that Section 553 of the APA shall not apply to the promulgation or revision of

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most nationally-applicable CAA rules, including NSPS or EG rules,[3] the federal courts continue to recognize the right of the public to petition EPA for rulemaking under the CAA. [4]

The Petitioners recognize that the federal courts' authority to review EPA decisions on whether to grant or deny petitions for rulemaking is "extremely limited and highly deferential." *See WildEarth Guardians v. EPA*, 751 F.3d 649 (D.C. Cir. 2014) (denying a challenge to EPA's decision to deny a petition for rulemaking under Section 111 on the basis of ongoing budget uncertainties and limited resources). Nevertheless, Petitioners believe that the Final Rules are fundamentally flawed, are inconsistent with the structure and purpose of Section 111 of the CAA, and therefore warrant revision. Accordingly, Petitioners submit this petition for rulemaking in the hope that EPA will recognize that numerous flaws remain unaddressed, despite timely comments raising those concerns, and initiate a rulemaking process to address them. Since Petitioners believe that the issues for which rulemaking is requested below can be more fully vetted through an official notice and comment rulemaking process, the issues are described here only in general terms. Petitioners look forward to providing greater detail and proposed solutions for the concerns identified below during the rulemaking process. Nevertheless, because Petitioners did comment on the issues identified in this Section III during the rulemaking process for the Final Rule, such issues are also ripe for judicial review. 42 U.S.C. § 307(d).

A. Overlapping Applicability of Old and New Subparts

In promulgating the Final Rules, the Agency has created an unintelligible web of standards that apply to MSW landfills in contravention of Section 111, consisting of: (1) old

[3] 42 U.S.C. § 307(d).

[4] *Massachusetts v. EPA*, 415 F.3d 50, 53 (D.C. Cir. 2005) (noting that Section 307 authorizes judicial review of EPA's decision to deny a petition for rulemaking), *rev'd and remanded on other grounds by* 549 U.S. 497, 527 (2007) (referring to the filing of a petition for rulemaking under the CAA as "procedural right" and confirming that the denial of such a petition may be addressed via judicial review under Section 307). *Accord Friends of the Earth v. EPA*, 934 F. Supp.2d 40, 54 (D.D.C. 2013) ("EPA is required to respond to a citizen petition for rulemaking.") (citing *Massachusetts v. EPA*).

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Subparts WWW and Cc, which have not been expressly superseded; (2) 40 C.F.R. Part 63, Subpart AAAA ("the Landfill NESHAP" or "Subpart AAAA"), which continues to rely on Subparts WWW and Cc for its substantive compliance obligations; and (3) new Subparts XXX and Cf, which were intended to update the standards for landfills but were adopted as free-standing and separate subparts.

Despite many comments asking EPA to address the potential overlap among its old rules, the new rules, and the Landfill NESHAP (which requires compliance with Subparts WWW and Cc), EPA did not address that critical concern. For example, WM's comments expressly asked "how EPA's proposal to correct and clarify the regulatory language based on Subpart WWW would affect Subpart WWW itself, and importantly, compliance obligations for existing facilities." WM 2014 Comments at 3-4. Republic similarly commented that "EPA must also address the compliance obligations that may result for sites that must transition from Subpart WWW to Subpart XXX following a modification." Republic 2015 EG Comments at 33. Both companies also commented that the decision to adopt entirely separate subparts for the revised rules (Subparts XXX and Cf) ignores the fact that the Landfill NESHAP continues to require compliance with the old subparts (Subparts WWW and Cc). WM 2015 Comments at 70; Republic 2015 EG Comments at 33.

Despite these comments, EPA adopted applicability provisions in its new subparts that fail to take into account the applicability provisions of the old subparts and the Landfill NESHAP, which EPA did not revise. EPA acknowledges that the Agency could have accomplished the updates to Subparts WWW and Cc merely by updating those old subparts. *See* 81 Fed. Reg. at 59333, FN 3. Such a decision would have avoided the confusion that has resulted. Nevertheless, the Agency decided instead to forge a more complicated path by

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updating Subparts WWW and Cc via promulgation of two new and separate subparts. As a result, the applicability provisions for all five rules—the old and new NSPS and EG and the Landfill NESHAP—are now codified as follows:

- Subpart Cc: landfills constructed / modified "before May 30, 1991"[5]
- Subpart WWW: landfills constructed / modified "on or after May 30, 1991"[6]
- Subpart Cf: landfills constructed / modified "on or before July 17, 2014"[7]
- Subpart XXX: landfills constructed / modified "after July 17, 2014"[8]
- Subpart AAAA: requiring landfills that are major sources or area sources meeting certain design capacity thresholds to comply with WWW or Cc[9]

Because of the overlapping applicability provisions, a landfill will necessarily meet the applicability criteria of more than one subpart, as illustrated in the table provided below:

Landfills that were last constructed / modified ...	Emission Guidelines		NSPS	
	Cc (old)	Cf (new)	WWW (old)	XXX (new)
... before May 30, 1991	×	×		
... on or between May 30, 1991 & July 17, 2014		×	×	
... after July 17, 2014			×	×

This overlapping applicability is unreasonable because on their face the rules would require landfills to simultaneously comply with different and overlapping provisions from either the new or old subparts, forcing Petitioners to engage in two different sets of activities to ensure compliance with the new and old rules. In doing so, EPA is forcing landfills to meet all provisions of the Final Rules without allowing landfills to benefit from the regulatory provisions that EPA intended to update and streamline, since the old rules will still apply. As just one

[5] 40 C.F.R. § 60.32c.

[6] 40 C.F.R. § 60.750.

[7] 40 C.F.R. § 60.31f.

[8] 40 C.F.R. § 60.760.

[9] 40 C.F.R. §§ 63.1935; 63.1955.

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example, EPA eliminated the wellhead oxygen parameter as a basis for requiring corrective action in Subparts XXX and Cf, but Subparts WWW and Cc—one of which will still apply to all landfills—will continue to require all landfills to take corrective action for oxygen exceedances.

The overlapping applicability provisions contravene the CAA because they have the effect of simultaneously regulating some landfills as both "new" landfills subject to a NSPS and "existing" landfills subject to an EG. That result is prohibited by the CAA, which defines the two terms "new source" and "existing source" in mutually exclusive fashion and establishes separate programs for "new" and "existing" sources—Section 111(b) for new sources, and Section 111(d) for existing sources. Given that the definition of "existing source" is "any stationary source *other than* a new source," a single source cannot be regulated simultaneously as both a "new source" under a Section 111(b) NSPS and an "existing source" under a Section 111(d) EG. 42 U.S.C. § 7411(a)(6). But that is exactly the result of EPA's failure to properly address the overlapping applicability of its old and new NSPS and EG for some landfills, as illustrated above.

Likewise, EPA failed to address the fact that the Landfill NESHAP still requires compliance with the substantive obligations of Subparts WWW and Cc. Despite many comments identifying the inconsistency between the proposed rules and the Landfill NESHAP, EPA completely failed to address these comments in the Final Rules.

EPA's own statements confirm that the Agency did not intend for landfills to comply with both the old and new rules simultaneously. The most obvious indication of EPA's intent with the Final Rules is EPA's description of them as a "revision," "update," or "changes" to the old rules. *See e.g.*, 81 Fed. Reg. at 59276 ("Based on this review, the EPA has determined that it is appropriate to revise the Emission Guidelines . . ."). Even more explicitly, the preambles

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explain that EPA believes "the most appropriate way to proceed is to establish a new subpart that includes both the verbatim restatement of *certain provisions* in the existing Emission Guidelines and revisions to, or the addition of, *other provisions*." *Id.* at 59286. This statement confirms that EPA did not intend for all provisions of Subpart WWW and Cc to continue to apply as currently written, but EPA's Final Rules do not reflect that intent. EPA even justified its decision to revise Subparts WWW & Cc by quoting Supreme Court precedent holding that "[r]egulatory agencies do not establish rules of conduct to last forever," even though EPA has failed in this instance to adopt any language to terminate the effectiveness of such standards. *Id.* at 59277 (citing *Am. Trucking Ass'n v. Atchison, Topeka & Santa Fe Ry.*, 387 U.S. 397, 416 (1967)).

EPA's failure to enact appropriate applicability provisions in its Final Rules renders them unlike any other NSPS revision that EPA has ever adopted. All of the other NSPS revisions that EPA has adopted make clear that only one NSPS subpart should apply at a time (and EPA has never before revised an EG). For example, when EPA adopted a new standard for stationary combustion turbines in Subpart KKKK, EPA confirmed that sources subject to the new Subpart KKKK provisions would be "exempt" from the provisions of Subpart GG. 40 C.F.R. § 60.4305 ("Stationary combustion turbines regulated under this subpart [KKKK] are exempt from the requirements of subpart GG of this part."). Similarly, after EPA adopted a new standard in Subpart Da for fossil fuel-fired steam generators, EPA revised the old Subpart D to make clear that any facility subject to the new standard "is not subject" to the old standard. 40 C.F.R. § 60.40 ("Any facility subject to . . . subpart Da . . . of this part is not subject to this subpart."). Many other subparts contain language of similar effect to avoid the overlap of old and newly revised standards. *See, e.g.*, 40 C.F.R. Part 60, Subparts Ea, Eb, K, Ka, Kb, AA, AAa, J, Ja, VV,

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VVa, GGG, GGGa, AAAA, BBBB, CCCC, DDDD, EEEE, FFFF. The only instance of EPA adopting a new subpart without expressly addressing the applicability of an old subpart that Petitioners were able to identify is Subpart TTTT, in which EPA adopted standards for electric generating units, but in that case no overlap occurred because Subpart TTTT only regulates an entirely new pollutant—greenhouse gas emissions—that was not covered by the preexisting standards.

EPA's error in failing to address the overlapping applicability of the Final Rules, Subparts WWW and Cc, and the Landfill NESHAP requires an additional rulemaking action. Only through further revisions to its regulations can EPA make sufficiently clear that only the newly "revised" and "updated" versions of the regulations apply, as EPA originally intended. In the case of the Landfill NESHAP, EPA must acknowledge that compliance with the Final Rules satisfies the sections of Subpart AAAA that currently reference Subparts WWW and Cc. When EPA promulgated the Landfill NESHAP, the Agency concluded that substantive provisions of Subparts WWW and Cc were the appropriate basis for the rule's MACT standard. Having now updated Subparts WWW and Cc via promulgation of the Final Rules, the Agency must carry through such updates to the Landfill NESHAP.

Certainly, if a State adopts a Section 111(d) plan for implementing the EG that confirms compliance with the new EG satisfies the old EG, and EPA approves that plan, the State may be able to resolve this overlapping applicability concern for landfills subject only to the old and new EG (i.e., those constructed and last modified prior to May 30, 1991). However, Section 111(b) does not authorize States to revise the applicability provisions of the standards that EPA has adopted for new sources. Therefore, States will not have the authority to resolve the

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applicability concerns for any landfill subject to Subpart WWW, XXX, or both (i.e., those constructed and last modified on or after May 30, 1991).

When EPA initiates a rulemaking process to resolve the overlapping applicability of Subparts XXX, WWW, Cf, and Cc, and the Landfill NESHAP, EPA must also address the process by which a landfill transitions from the old rules to the new. Again, despite numerous comments requesting that EPA address the procedures and timing for transitioning to the compliance obligations of the Final Rules, EPA simply failed to respond. *See* WM 2014 Comments at 3-4; Republic 2015 EG Comments at 33. As a result, states and regulated entities are left without any direction on how to implement the new rules once they take effect. Landfills will need some time to make the changes that the Final Rules require, so a transition policy should allow a reasonable amount of time for achieving compliance.

Thus, Petitioners respectfully ask EPA to convene a notice-and-comment rulemaking action to address this overlapping applicability concern through rule revisions, accompanied by provisions that allow a reasonable time period for compliance with the new requirements.

B. Design Plan and Alternatives Approval Process

The Final Rules contain numerous and conflicting provisions addressing the need for submittal and approval of landfill gas collection and control system ("GCCS") design plans, the obligation to operate in accordance with an approved design plan, and the potential enforcement risk for facilities that have not yet received approval of their design plan. Petitioners request that the Agency initiate a rulemaking intended to provide greater clarity for compliance obligations related to the design plan approval process.

Under Subparts WWW and Cc, Petitioners have experienced a very low rate of agency review and approval of design plans, including alternatives to the design standards and operating parameters, leaving many facilities without any certainty as to whether the design plan

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requirements have been met or whether their alternatives are appropriate. At proposal, EPA solicited comments on streamlining the design plan approval process. Petitioners urged EPA to clarify and streamline these requirements, recommending that the Agency (1) establish a defined timeline for review and approval or denial of design plan submittals; and (2) establish a process for automatic approval should the Administrator or delegated authority fail to respond within the established deadline. As an alternative, Petitioners urged EPA to reexamine the need for an affirmative approval of design plans in general, noting that many EPA rules do not require approval of similar types of conceptual plans. See WM 2014 Comments at 30-35. In supplemental comments submitted to EPA, Petitioners provided numerous examples of EPA rules that do not require agency approval of analogous plans. A copy of Petitioners' Supplemental Comments[10] is attached hereto at Appendix "A". (Note that these comments were provided at EPA's request.) In the Final Rules, EPA did not address Petitioners' comments and instead worsened the compliance uncertainty associated with GCCS design plan review and approval. Thus, Petitioners request that the Agency initiate a rulemaking, respond to Petitioners' comments, and provide greater clarity around compliance obligations related to the design plan approval process.

1. The Final Rules Do Not Ensure Agency Review or Approval of Design Plans

In the Final Rules, EPA definitively stated that agency approval of GCCS design plans is required. See 40 C.F.R. § 60.762(b)(2)(i) and 40 C.F.R. § 60.767(c)(4). Yet, having established in the Final Rules that design plans must be submitted for approval, EPA's approval process fails to ensure that the Agency will ever review submitted design plans, let alone approve them.

[10] Petitioners note that EPA has failed to include the Supplemental Comments in Appendix A in the dockets for the Final Rules, despite requesting that Petitioners submit them. Petitioners have attached the Supplemental Comments to this Petition for the Agency's ease of review.

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Specifically, section 60.767(c)(5) requires "[t]he landfill owner/operator to notify the Administrator that the design plan is completed and submit a copy of the plan's signature page. The Administrator has 90 days to decide whether the actual design plan should be submitted for review. If the Administrator chooses to review the plan, the approval process continues as described in (c)(6) of this section." The section thus leaves entirely to the discretion of EPA or delegated authority whether to review any submitted design plan. Section 60.767(c)(6) creates even more confusion as it consists of two contradictory sentences. The first requires that the Administrator, upon receipt of an initial or revised design plan, "*[m]ust* review information submitted . . . and either approve it, disapprove it, or request additional information." But the second sentence then imposes an unacceptable enforcement risk on the landfill owner/operator in the event that "the Administrator indicates that submission is not required, or does not respond within 90 days," by stating that "the landfill owner/operator *can* continue to implement the plan with the recognition that the owner/operator is proceeding at their own risk." The same paradoxical provisions are reflected in Subpart Cf in Section 60.38f(d)(5) and (6).

Notwithstanding use of the word "must" in these provisions, the overall process described in (c)(5) and (6) indicates that the Agency may choose whether or not to review the design plan. This is completely at odds with the Agency's unambiguous statements in the Final Rules requiring design plan approval. The EPA has thus created a system by which the landfill owner/operator is required to submit a design plan for agency approval, but neither EPA nor its state or local counterparts are held accountable for actually reviewing and approving or disapproving those plans. In fact, the process outlined in the Final Rules does not even require the regulatory agencies to acknowledge receipt of the plans.

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2. The Final Rules Provide no Clarity on Whether Landfills Must Proceed with GCCS Installation in the Absence of Agency Approval

The Final Rules state that if the Administrator does not approve or disapprove the design plan, or request additional information within 90 days of receipt, then the owner or operator *"can"* continue with implementation of the design plan, recognizing that they would "be proceeding at their own risk." 40 C.F.R. § 60.767(c)(6); 40 C.F.R. § 60.38f(d)(5) and (6). The language is permissive, failing to inform the regulated entity what it should or must do when the regulator fails to review and approve their plan, or to provide a path forward for obtaining plan approval should the agency be non-responsive. 40 C.F.R. § 60.767(c)(5) & § 60.38f(d)(5).

This permissive language conflicts with other provisions of the Final Rules requiring actions to be taken in conformance with an approved plan. For example, the compliance provisions in the Final Rules at Sections 60.765(b) and 60.36f(b) state that the landfill owner/operator "must place each well or design component as specified in the *approved* design plan as provided in § 60.767(c) (emphasis added)." Additionally, monitoring provisions at Sections 60.766(d) and 60.37f(d) require that a landfill owner/operator complying with the GCCS operational standards by using a device other than a non-enclosed flare, an enclosed combustor, or treatment system *must* provide information satisfactory to the Administrator, and that the Administrator must review and approve it or request additional information. Likewise, where the landfill owner/operator seeks to employ alternatives to the operational standards, test methods, compliance provisions or other aspects of the Final Rules, the landfill owner/operator *must* submit those alternatives to the Agency in the design plan. 40 C.F.R. § 60.767(c)(2) and § 60.38f(d)(2). Thus, even though key implementation requirements are contingent on design plan approval, the Final Rules do not suspend a landfill's compliance obligations pending that

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approval, leaving the landfill with little choice but to take the risk that EPA has identified in its rule language.

These contradictory requirements are paralyzing for affected facilities that have prepared and submitted GCCS design plans in good faith. In light of the requirements in the Final Rules at Sections 60.762(b)(2)(ii) and 60.33f to seek permits, award contracts, install and start up a GCCS within 30 months of the regulatory trigger event, a landfill owner or operator is placed into an untenable situation: either face potential enforcement risk for missing the 30-month compliance deadline, or face potential financial *and* enforcement risk for installing and operating a multi-million-dollar gas collection system in accordance with a design plan that is later disapproved.

3. EPA's Design Plan Approval Process Subjects Affected Facilities to Unclear Compliance Obligations and Untenable Financial and Enforcement Risk

The Final Rules' design plan approval process creates a circumstance in which affected facilities are subject to risk of enforcement regardless of which course of action they take and through no fault or failure of their own. Indeed, the Final Rules conclude the confusing design plan approval process with the following statement:

> In the event that the design plan is required to be modified to obtain approval, the owner or operator must take any steps necessary to conform any prior actions to the approved design plan and any failure to do so could result in an enforcement action.

40 C.F.R. § 60.767(c)(5) and 40 C.F.R § 38f(d)(5).

This language is unintelligible, and notably, was not included in any of EPA's rulemaking proposals. As an initial matter, EPA does not explain how one can achieve the feat of conforming prior actions to a newly imposed requirement. Second, EPA does not explain whether the resulting enforcement risk is retroactive, prospective, or both. Certainly, the threat

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of retroactive enforcement for good-faith actions taken pursuant to a design plan that an agency declined to review contravenes basic principles of fairness and due process. Finally, EPA failed to even acknowledge the significant financial risk associated with installing a multi-million dollar system that may later (maybe years later) be determined insufficient. This risk is particularly relevant for landfills that propose site-specific alternatives. Indeed, the Final Rules readily acknowledge that:

> Because of the many site-specific factors involved with landfill gas system design, alternative systems may be necessary. A wide variety of system designs are possible, such as vertical wells, combination horizontal and vertical collection systems or horizontal trenches only, leachate components, and passive systems.

40 C.F.R. § 60.767(c)(6) and 40 C.F.R. § 60.38f(c)(6). Thus, although EPA clearly acknowledges the need for alternative designs, and that the landfill owner/operator is required to obtain Agency approval for those designs, EPA makes no commitment to review those alternatives. EPA's response on this issue is insufficient. EPA states:

> Because the initial design can significantly affect the long-term operation of the landfill GCCS, and that design is site-specific, the EPA has retained the design plan approval process to provide flexibility to the sites on designing an appropriate system, while also providing a level of regulatory oversight *before the system is installed* in order to minimize scenarios where an improperly designed system is constructed and installed.

EPA, Responses to Public Comments on EPA's Standards of Performance for Municipal Solid Waste Landfills and Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills: Proposed Rules, 965 (hereinafter "Response to Comments Document") (emphasis added). Far from minimizing these risks for regulated entities, EPA's design plan approval process creates enforcement risk where none should exist and expressly does not ensure any level of regulatory oversight before the GCCS is installed. Because the GCCS requirement is the

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centerpiece of the Final Rules, ambiguity and conflicting provisions concerning GCCS design plan approval cause the Final Rules to lack the most fundamental element of a properly functioning regulatory system, which is to provide fair and timely notice of the compliance obligations to which a regulated entity is subject, in this case via approval of required regulatory documents. *See generally, United States v. Trident Seafoods*, 60 F.3d 556 (9th Cir. 1995); *Gates & Fox Co. v. OSHRC*, 790 F.3d 154 (D.C. Cir. 1986); *General Electric v. U.S. EPA*, 53 F.3d 1324 (D.C. Cir. 1995). If GCCS design plan approval is a required component of a rule, then agency review and approval or denial must also be a rule requirement, so that a regulated entity can move forward with implementation, confident that it has been apprised of its compliance obligations. The Final Rules fail to provide this essential regulatory element.

4. EPA Must Correct the Rules to Require Affirmative Agency Approval in a Timely Manner

Petitioners have observed a demonstrated failure by agencies to review, approve, or even acknowledge design plan submittals under the existing Subparts WWW and Cc. WM and Republic estimate that only about 40% of their landfills operate pursuant to an approved design plan due to lack of timely action by EPA and state authorities. Accordingly, Petitioners urge EPA to initiate a rulemaking to address this problem under the Final Rules. In that context, we again ask EPA to eliminate the need for agency review and approval of GCCS plans, which is a system that has simply not worked to date. Instead, Petitioners recommend that delegated authorities should be allowed to rely upon a licensed, third-party professional engineer ("PE") certification of design plans and revisions in lieu of an agency review and approval process. Petitioners recommend that certified plans be maintained onsite for inspection and/or submittal to the implementing agency. This approach is consistent with sixty-two other Clean Air Act rulemakings identified in Petitioners' Supplemental Comments attached at Appendix A.

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Reliance on a certification by a licensed, third-party PE in lieu of agency approval would also be consistent with the approach EPA finalized in the Agency's recent NSPS rulemaking impacting the Oil & Natural Gas Sector. *See* EPA, *Oil & Natural Gas Sector: Emission Standards for New Reconstructed, and Modified Sources*; *Final Rule*, 81 Fed. Reg. 35824, 35942, 35848 (June 3, 2016) (finalizing standards allowing for PE certification of closed vent system design and technical infeasibility to connect a pneumatic pump to existing control device). In the event that EPA continues to believe that design plan review and approval is necessary, we ask the Agency to consider a defined timeframe for such review and a deemed approval in the event that the reviewing agency fails to respond in a timely manner.

C. Non-Producing Areas

Petitioners request that the Agency initiate a rulemaking proceeding to provide compliance flexibility in landfill areas with declining gas flows. Such flexibility is critically important to landfills required to implement the more stringent 34 Mg/year non-methane organic compound ("NMOC") emission threshold. In the Final Rules, EPA failed to address three critical issues: (1) the Final Rules do not allow for the capping, removal, or decommissioning of portions of a GCCS in non-producing areas; (2) the term "closed area" is too narrowly defined, which in turn limits the utility of the 1% NMOC exclusion; and (3) the Final Rules do not allow the use of surface emission monitoring ("SEM") to demonstrate that capping, removal, or decommissioning of a GCCS is appropriate based on-site specific surface methane concentrations.

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1. The Final Rules Should Allow for the Capping, Removing, and Decommissioning of GCCS From Non-Producing Areas of Active and Closed Landfills

In the Final Rules, EPA restricts capping, removing, or decommissioning of a GCCS to entire closed landfills and does not allow for capping, removing, or decommissioning[11] of portions of a GCCS in closed or non-producing *areas* of otherwise active landfills or closed landfills. *See* 40 C.F.R. § 60.762(b)(2)(v); 40 C.F.R. § 60.33f(f). In other words, EPA does not allow for partial removal or decommissioning of a GCCS at any landfill, closed or open. At proposal, EPA acknowledged and requested comment on how non-producing areas of the landfill (*i.e.*, areas that are no longer generating landfill gas), could be excluded from gas collection and control requirements and whether the criteria for capping or removing a GCCS in Subparts WWW or Cc are appropriate. *See* 79 Fed. Reg. at 41783 & 41792. In the 2015 Supplemental Proposal, EPA proposed criteria for capping and removing a GCCS from the entire closed landfill, or portions of an active landfill.

In the Final Rules, however, EPA only allows for removal of a GCCS from entire closed landfills, *and not non-producing areas*. In the preamble to the Final Rules, EPA states that the Agency intended to provide flexibility to landfills with declining gas production by allowing landfills to demonstrate that a GCCS cannot operate for 15 years and should be removed. *See* 81 Fed. Reg. at 59357-58 & 81 Fed. Reg. at 59302 ("EPA is retaining the requirement to operate the GCCS for 15 years, but is providing flexibility to address declining gas flows in areas where the GCCS has not operated for 15 years."). Petitioners appreciate the inclusion of this option, but note that EPA has completely failed to achieve its goal of providing flexibility to *areas* with

[11] Petitioners note that we have repeatedly requested that EPA define the term "decommission" as used in the Final Rules, but EPA has refused to do so. We again request that the Agency provide a definition for "decommission" that provides a stepdown procedure or options for suspending operation of individual collectors or portions of the GCCS system in areas with declining gas flows.

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declining flows by finalizing removal criteria that only allow for GCCS removal or decommissioning in entire closed landfills.

By excluding from the Final Rules an option for decommissioning or removing a portion of a GCCS in non-producing areas, EPA has ignored Petitioners' and others' repeated concerns about declining gas production. *See e.g.*, WM 2014 Comments at 17-19; WM 2015 comments at 12-13; Small Business Advocacy Review Panel, Final Report on EPA's Planned Proposed Rules Standards of Performance for Municipal Solid Waste Landfills and Review of Emissions Guidelines for Municipal Solid Waste Landfills (July 21, 2015) (hereinafter "SBARP Final Report"). EPA has not explained why the Agency has arbitrarily limited GCCS decommissioning or removal to entire closed landfills, other than to note that such change was based on the Agency's consideration of public comments. However, Petitioners have not identified any comments in the rulemaking docket that question EPA's proposed approach to allow for removal or decommissioning of portions of a GCCS in nonproducing areas.

Without such flexibility, landfills with areas of declining gas production will face significant hardships associated with the maintenance of a GCCS in those areas, including an inability to comply with wellhead parameters in the Final Rules, risk of pulling ambient air into the GCCS and damaging the system, and significant use of fossil fuels to maintain flare operation, none of which provide any emission reduction or other environmental benefit. Petitioners request that EPA initiate a notice and comment rulemaking to allow for removal or decommissioning of GCCS in nonproducing areas of landfills, whether closed or active.

2. EPA's Definition of "Closed Area" Is Needlessly Narrow

The Final Rules allow the landfill owner/operator to use actual gas flow measurements to demonstrate that "closed areas" may be excluded from GCCS coverage because they contribute less than 1% of a landfill's total NMOC emissions. However, EPA's definition of "closed area"

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in the Final Rules is unnecessarily restrictive as it includes only areas that are physically separated from active portions of a landfill: Under the Final Rules, EPA has defined "closed area" to mean a:

> separately lined area of an MSW landfill in which solid waste is no longer being placed. If additional solid waste is placed in that area of the landfill, that landfill area is no longer closed. The area must be separately lined to ensure that the landfill gas does not migrate between open and closed areas.

40 C.F.R. § 60.761; 40 C.F.R. § 60.41f. Therefore, under the Final Rules, separately lined areas may be excluded from control upon a showing of less than 1% of NMOC contribution using actual flow rates. *See* 40 C.F.R. § 60.769(a)(3)(ii)(B).

EPA's decision to define "closed area" so narrowly fails to provide landfills with declining gas flow much needed flexibility, particularly in light of the stringent 34 Mg/year NMOC emission threshold in the Final Rules, and is based on the mistaken premise that physical separation is needed to prevent gas migration from closed areas. In response to the 2015 Supplemental Proposal, Petitioners urged EPA to expand its definition of "closed area" to include areas with low gas flow, even if such areas are not physically separated from active areas by means of a physical barrier. Petitioners stated that EPA's concern about gas migration from an unclosed area with a GCCS to a closed area without a GCCS was unfounded because landfill gas travels from areas of high pressure to areas of low pressure. *See e.g.* Republic 2015 EG Comments at 29 ("EPA's concern that gas could migrate from an unclosed area (with GCCS) to a closed area (without GCCS) is unfounded because landfill gas travels from areas of high pressure to areas of low pressure, not the other way around.").

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In justifying its decision not to expand the definition of "closed area" in the Final Rules, EPA relies on the same unsupported assertion from the 2015 Supplemental Proposal, stating in the Response to Comments Document that:

> the EPA has retained the requirement that closed areas of open landfills must be physically separated (e.g., separately lined) . . . because [EPA] continue[s] to believe that landfill gas can migrate between areas of the landfill. As described in the [2014 Proposal], measurements might not accurately reflect actual emissions from the given landfill area because gas could be moving underground and escaping or being collected from an adjacent section of the landfill.

Response to Comments Document at 223. EPA further states that Petitioners failed to provide additional data that gas migration will not occur. *See id.* But additional data is unnecessary to confirm the laws of physics, which unquestionably dictate that gas would instead migrate from the closed area toward the open area with the GCCS, to the extent that it would move at all. EPA has not offered any data to support its unfounded assertion that gas migration will occur.

Petitioners request that EPA undertake a notice and comment rulemaking to correct the definition of "closed area" in the Final Rules to eliminate physical separation as a necessary criterion. A revised definition of "closed area" would allow nonproducing areas to take advantage of actual flow data to demonstrate that such areas contribute less than 1% of the landfill's NMOC emissions. This same definition of "closed area" should be used by EPA when revising the GCCS removal criteria to allow for removal or decommissioning of portions of a GCCS from nonproducing areas, as discussed above.

3. The Final Rules Should Allow for Surface Emission Monitoring to Support Removal or Decommissioning of a GCCS

In the 2015 Supplemental Proposal, EPA proposed to allow owners/operators to use SEM for purposes of determining when a GCCS can be removed or partially removed. 80 Fed. Reg. at 52150. Nevertheless, under the Final Rules, the Agency has not included SEM as a basis to

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demonstrate that site specific conditions warrant removal of GCCS or portions thereof. *See* 40 C.F.R. § 60.33f(1)(f) & 40 C.F.R. § 60.764(1)(f) (excluding SEM from GCCS removal criteria). The unavailability of SEM for GCCS removal significantly increases the burden of the Final Rules' more stringent 34 Mg/NMOC emission threshold and magnifies concerns for landfills with declining gas production. Without the option to use SEM to demonstrate that GCCS removal or decommissioning is appropriate, the 34 Mg/year NMOC emission threshold will further delay the point at which a landfill may remove controls, even when site-specific conditions would warrant removal.

EPA's decision to exclude the option of using SEM from the GCCS removal criteria in the Final Rules significantly and unnecessarily reduces the flexibility available to landfills with areas of declining gas flows and is contrary to the numerous comments submitted to EPA by diverse stakeholders. *See e.g.* WM 2015 Comments; National Association of Clean Air Agencies, Comments on 2015 Supplemental Proposal (Docket ID EPA-HQ-OAR-2003-0215-0197; EPA-HQ-OAR-2014-0451-0187) ("NACAA 2015 Comments").

The SEM criteria for GCCS removal or decommissioning presented in the 2015 Supplemental Proposal addressed key concerns raised by Petitioners for the past twelve years regarding a step-down for GCCS operations due to declining flow.[12] Many areas of landfills with declining flows struggle to maintain sufficient gas flow to operate their control systems, even under the 50 Mg/year threshold established under Subparts WWW and Cf. At the lower 34 Mg/year threshold, landfill owner/operators will need to use increasing amounts of fossil fuel to maintain flare operation, which *increases* emissions of GHG and other pollutants, a result clearly

[12] *See* Docket ID Numbers EPA-HQ-OAR-2014-0451-0037, EPA-HQ-OAR-2003-0215-100, EPA-HQ-OAR-2003-0215-017, EPA-HQ-OAR-2003-0215-0055, EPA-HQ-OAR-2003-0215-0057 and EPA-HQ-OAR-2003-0215-0058, EPA-HQ-OAR-2014-0451-0176; *see also* SWANA, Letter to JoLynn Collins, EPA Waste and Chemical Process Group (Docket ID EPA-HQ-OAR-2003-0215-003).

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inconsistent with the purpose of the Final Rules. Therefore, Petitioners urge EPA to allow landfill owners and operators the option to use SEM to demonstrate that GCCS removal is appropriate.

EPA's only explanation for removing such necessary flexibility from the Final Rules is that several commenters objected to the use of SEM for GCCS removal demonstrations. *See* 81 Fed. Reg. at 59357. However, the Agency ignored the majority of comments that supported the use of SEM for GCCS removal demonstrations, including comments submitted by the National Association of Clean Air Agencies ("NACAA"), a national, non-partisan, association of air pollution control agencies in 40 states, the District of Columbia, four U.S. territories and 116 metropolitan areas with air quality professionals. *See generally* NACAA 2015 Comments. In fact, of the over 200 comments in the combined dockets for the Final Rules, less than a handful of commenters explicitly raised concerns with the use of SEM for determining when a GCCS or portions of it could be capped, removed or decommissioned.

EPA has not explained why the Agency relied on comments from so few entities to justify removing the SEM criterion and ignored supporting comments from numerous, diverse stakeholders with substantial experience implementing EPA's CAA Section 111 rules. Accordingly, Petitioners request that EPA initiate a rulemaking to revise the Final Rules to allow for SEM for purposes of demonstrating the appropriateness of GCCS removal and decommissioning, based on site-specific conditions.

D. EPA Should Adopt a Clear Definition of Cover Penetrations

In its 2014 Proposal, EPA sought to "clarify" that "all cover penetrations must be checked during quarterly surface monitoring." 79 Fed. Reg. at 41804. However, that proposal actually represented a significant change to current requirements, as noted by several commenters. *See e.g.* Republic 2015 EG Comments at 5-7; WM 2015 Comments at 25-27.

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Whereas Subparts WWW and Cc only require monitoring "where visual observations indicate elevated concentrations of landfill gas, *such as* distressed vegetation and cracks or seeps in the cover," the Final Rules add to the end of that provision "*and all cover penetrations*." *Compare* 40 C.F.R. § 60.753(d) *with* 40 C.F.R. § 60.763(d). The Final Rules also state that an owner/operator "must monitor *any openings*." *Id.*

With the addition of the phrase "and all cover penetrations," EPA has shifted the focus away from "visual observations [of] elevated concentrations of landfill gas" (with cracks and seeps as just examples), to a different focus on cover penetrations, regardless of whether such penetrations exhibit any visible signs of landfill gas. Given that very few cover penetrations do exhibit visual signs of elevated concentrations, the effect of EPA's change forces landfill owners and operators to monitor "all cover penetrations" instead of only monitoring where visual observations suggest that monitoring is warranted. Thus, EPA has fundamentally altered the surface monitoring requirement. Far more than a mere "clarification" of existing requirements, EPA's "all cover penetrations" provision is entirely new and potentially burdensome, and commenters opposed it.

But perhaps the most disconcerting aspect of this new requirement is the lack of any clear definition of the "cover penetrations" that all landfills must now monitor. Although EPA's new provision certainly expands the monitoring requirement far beyond its previous scope, the lack of a definition of "cover penetration" leaves uncertain the full scope of this new requirement. Taken literally, the requirement to monitor "all cover penetrations" could be interpreted to require landfills to monitor every single stake in the ground, including every fence and sign post, of which most landfills have thousands. Furthermore, EPA's use of the term "any openings" is an ambiguous extra term that adds further confusion to EPA's intended meaning of "cover

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penetrations." In addition to providing a definition of "cover penetrations," the Agency must remove the reference to "any openings" in the Final Rules to avoid creating undue confusion.

EPA has recognized that a completely literal interpretation of "cover penetrations" was not intended. Specifically, EPA noted in the preambles to the Final Rules that "[c]over penetrations include wellheads, but do not include items such as survey stakes, fencing or litter fencing, flags, signs, trees, and utility poles." 81 Fed. Reg. at 59288. EPA also confirmed more broadly in the Response to Comments Document that "cover penetrations" is only intended to include "component[s] of the GCCS system or leachate collection and control system that completely passes through the landfill cover into waste, such as wellheads, leachate risers, and manholes." Response to Comments Document at 745. This more limited definition of "cover penetrations" is logical—a "cover penetration" should not present a significant emissions concern if it does not reach the waste mass, and most do not, so only those deep enough to reach waste warrant monitoring.

Although EPA's clarification in the preambles to the Final Rules is helpful and appreciated, Petitioners are concerned that some risk of confusion remains without a codified definition of "cover penetrations." Therefore, Petitioners respectfully request that EPA convene a rulemaking proceeding to adopt a clear definition of "cover penetrations" into the regulatory text to codify the guidance that EPA has provided in its preambles.

IV. Petition for Reconsideration

Pursuant to Section 307(d)(7)(B) of the CAA, EPA "shall convene a proceeding for reconsideration of [a] rule and provide the same procedural rights as would have been afforded had this information been available at the time the rule was proposed" so long as the party seeking reconsideration can demonstrate: (1) "that it was impracticable to raise such objection" during the public comment period or that "the grounds for such objection arose after the period

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for public comment (but within the time specified for judicial review)"; and (2) "such objection is of central relevance to the outcome of the rule." 42 U.S.C. § 7607(d)(7)(B). An objection "is of central relevance to the outcome of [a] rule" when that objection "provides substantial support for the argument that the regulation should be revised." *Coalition for Responsible Regulation, Inc. v. EPA*, 684 F.3d 102, 125 (D.C. Cir. 2012). EPA's Final Rules present several issues that meet these two criteria. As set forth herein, several aspects of the Final Rules were added after proposal, which fundamentally change the considerations addressed by commenters at proposal and significantly increase the compliance burden and overall impact of the Final Rules. Therefore, EPA must convene a reconsideration proceeding on the issues identified in this Section IV.

In addition, EPA's Final Rules are unlawful because EPA failed to provide adequate notice of many critical aspects of them. The United States Court of Appeals for the District of Columbia ("D.C. Circuit") has held that lack of notice claims are subject to the CAA reconsideration process, and so Petitioners raise those claims here as well. *See EME Homer City v. EPA*, 795 F.3d 118, 137 (D.C. Cir. 2015). With regard to the notice that EPA is required to provide in promulgating CAA rules, the D.C. Circuit has consistently held that EPA does not satisfy the Act's notice and comment requirement when the final rule is not the "logical outgrowth" of the proposed rule. *See e.g. Envtl. Integrity Project v. EPA*, 425 F.3d 992, 996 (D.C. Cir. 2005); *Northeast Maryland Waste Disposal Authority v. EPA*, 358 F.3d 936, 951-52 (D.C. Cir. 2004). A requirement in a final rule is the logical outgrowth of a proposed rule only if "interested parties should have anticipated that the change was possible, and thus reasonably should have filed their comments on the subject during the notice-and-comment period." *Northeast Maryland Waste Disposal Authority*, 358 F.3d at 952. The "logical outgrowth

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doctrine does not extend to a final rule that finds no roots in the agency's proposal because something is not a logical outgrowth of nothing." *Envtl. Integrity Project*, 425 F.3d at 996. EPA's Final Rules fails to meet the D.C. Circuit's standard for adequate notice, and thus should be reconsidered for that reason, as well as the substantive issues explained in more detail below.

A. Tier 4

The Tier 4 provisions of the Final Rules provide an alternative for determining when a landfill must install a GCCS after it has exceeded the NMOC emission threshold of 34 Mg/year based on modeled emissions. The Tier 4 methodology is based on a demonstration that site-specific surface methane emissions remain below 500 ppm, and thereby justify postponing the requirement to install a GCCS. Although the Tier 4 methodology was generally included in the Proposed Rules, the Final Rules include certain critical elements of Tier 4 that were not subject to notice and comment, are of central relevance to the Final Rules, and must be subject to reconsideration.[13]

At proposal, EPA characterized the Tier 4 methodology as a "flexibility" that could allow a landfill to potentially mitigate the impacts of the new 34 Mg/year NMOC emission threshold if site-specific conditions allowed, while at the same time encouraging early adoption of emission reduction strategies and best management practices such as oxidative cover practices and early gas collection or control to minimize surface emissions. *See e.g.* 80 Fed. Reg. at 52115-16 & 80 Fed. Reg. at 52127-28. EPA further described Tier 4 as the result of EPA's outreach to small entities who were concerned with their ability to comply with the lower NMOC emission threshold. *See* 80 Fed. Reg. at 52128.

[13] Certain aspects of the Tier 4 issues identified in Section IV.A.3, below, were subject to public comment. Nevertheless, such issues add to the burden associated with EPA's approach to Tier 4 in the Final Rules and significantly reduce the method's intended flexibility. As a result, Petitioners request that EPA address such issues in conjunction with a reconsideration proceeding on the other Tier 4 issues identified in this section.

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Many stakeholders including Petitioners, the Small Business Administration, state agencies, and environmental groups submitted comments in favor of Tier 4. Commenters agreed with EPA's analysis that a workable Tier 4 option would incentivize early adoption of methane reduction practices like alternative covers and early installation of collection and control equipment.[14] However, the changes to the Tier 4 methodology that are discussed herein have resulted in a method that is fundamentally different and more burdensome than the proposed Tier 4 that was broadly supported by diverse stakeholders. Such changes permanently alter the availability and utility of Tier 4, thereby removing much of EPA's intended flexibility from the Final Rules and providing no incentives to drive early emission reductions, which undermines the Agency's purpose in developing Tier 4 in the first instance.

At proposal, Tier 4 was available to any landfill with NMOC emission rates above 34 Mg/year. *See* 80 Fed. Reg. at 52148, 52152. In the Final Rules, however, EPA for the first time restricted the use of Tier 4 to landfills with modeled NMOC emission rates between 34 and 50 Mg/year using Tiers 1 or 2. *See* 40 C.F.R. 60.764(a)(6) & 40 C.F.R. 60.35f(a)(6); *see also* 81 Fed. Reg. at 59355 (describing 50 Mg/year cap on Tier 4 methodology as "change" to proposed Tier 4). EPA also introduced in the Final Rules a requirement that when average wind speeds exceed 4 mph and wind gusts exceed 10 mph, landfills must use undemonstrated wind barrier technology when conducting Tier 4 SEM. 40 C.F.R. § 60.764(a)(6)(iii)(A); 40 C.F.R. § 60.35f(a)(6)(iii)(A). In order to determine whether a wind barrier is required during a Tier 4 sampling event, the Final Rules mandate that a landfill must measure wind speeds with an anemometer. *Id.* EPA has also imposed burdensome notification requirements for Tier 4

[14] *See e.g.* Environmental Defense Fund, Comments on 2015 Supplemental Proposal, Docket ID EPA-HQ-OAR-2003-0215-0204 & EPA-HQ-OAR-2014-0451-0181; NACAA 2015 Comments; U.S. Small Business Administration's Office of Advocacy, Comments on 2015 Supplemental Proposal, Docket ID EPA-HQ-OAR-2003-0215-0187 & EPA-HQ-OAR-2014-0451-0155; WM 2015 Comments.

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monitoring based on weather-related cancellation events, which require landfill owners and operators to notify EPA or the relevant state administrator no later than 48 hours before a scheduled Tier 4 monitoring event if such event needs to be postponed due to weather conditions. *See* 40 C.F.R. § 60.767(l); 40 C.F.R. § 60.738(m). These aspects of Tier 4 were not subject to public comment and, as set forth herein, have fundamentally changed the nature of the proposed Tier 4, making the method unrecognizable from that which EPA proposed and industrial, environmental, and governmental commenters favored.

1. Tier 4 Should Not Be Limited to Landfills With Modeled NMOC Emission Rates Between 34-50 Mg/year

The proposed Tier 4 would have been available to all "landfills that exceed modeled NMOC emission rates using Tiers 1, 2, or 3" as a way "to demonstrate that site-specific surface methane emissions are low." 80 Fed. Reg. at 52102. A landfill that could demonstrate that surface emissions are "below 500 parts per million (ppm) for 4 consecutive quarters would not trigger the requirement to install a GCCS even if Tier 1, 2, or 3 calculations indicate that the 34 Mg/yr threshold has been exceeded." 80 Fed. Reg. at 52102. Under the Final Rules, however, Tier 4 is limited to sites with modeled NMOC emission rates between 34 and 50 Mg/year using Tiers 1 or 2. *See* 40 C.F.R. §§ 60.764(a)(6) and 40 C.F.R. 60.35f(a)(6).

EPA seeks to justify the limitation of Tier 4 to sites with modeled NMOC emission rates between 34 and 50 Mg/year by arguing that the limitation was necessary to "avoid[] a potential conflict between what is required under [the Final Rules] and what is required by [the Landfill NESHAP]." 81 Fed. Reg. at 59355 & 81 Fed. Reg. at 59298-99. EPA's rationale for restricting Tier 4 to landfills with modeled NMOC emissions between 34 and 50 Mg/year because of a potential conflict with the Landfill NESHAP is not a compelling justification; it is not based on a well-supported technical rationale, and is instead based only on the Agency's half-hearted

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attempt to ensure that its own regulations can be applied in harmony. As set forth in Section III above, EPA failed to address the inconsistency between the Landfill NESHAP and the Final Rules, and in the case of Tier 4, simply altered its applicability criteria in a manner that fails to fully address that inconsistency.

Limiting Tier 4 to sites between 34 and 50 Mg/year will adversely affect a substantial number of landfills subject to the Final Rules. EPA has identified only 105 (12 Subpart XXX sites and 93 Subpart Cf sites) of the total 1142 combined sites that will be subject to either Subpart XXX or Cf that are expected to have NMOC emissions between 34 and 50 Mg/year at up through 2025. This total is less than 10% of all sites affected by the Final Rules. *See* 81 Fed. Reg. at 59362 (Table 2) and 81 Fed. Reg. at 59305 (Table 2). WM, for instance, has identified only seven existing landfills with modeled NMOC emission rates between 34 and 50 Mg/year using Tiers 1 and/or 2, and which would be eligible to use Tier 4. WM has identified an additional seven sites with modeled NMOC emission rates currently below 34 Mg/year using Tiers 1 and/or 2, which WM anticipates will exceed the 34 Mg/year NMOC emission threshold in the next few years. Such landfills may be eligible to use Tier 4 if their modeled NMOC emission rates do not exceed 50 Mg/year. At all other WM landfills, Tier 4 would be unavailable regardless of the site-specific surface methane emissions at those sites. This is an inequitable result and conflicts with the intended purpose of Tier 4 to provide flexibility and encourage the early adoption of emission reduction strategies.

2. New Wind-Related Restrictions On Tier 4 Monitoring Are Unsupported

EPA proposed to limit the use of Tier 4 when the average wind speed exceeds 5 miles per hour and the instantaneous wind speed exceeds 10 miles per hour. *See* 80 Fed. Reg. at 52135-36. The Petitioners, among other commenters, submitted comments urging EPA not to finalize the

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proposed wind-speed restrictions, which Petitioners identified as unsupported by the available science and unduly restrictive. *See e.g.* WM 2015 Comments at 15-16. Neither Petitioners nor any other commenters submitted comment on use of a wind barrier as an alternative to the wind-speed restrictions because there was no indication in any of EPA's proposals that would suggest wind barriers were under consideration. Nevertheless, in the Final Rules, EPA replaced the proposed wind restriction with a requirement to use a wind barrier whenever "average wind speed exceeds 4 miles per hour or 2 meters per second or gust exceeding 10 miles per hour." 40 C.F.R. §§ 60.764 (a)(6)(iii)(A) & 40 C.F.R. 60.35f(a)(6)(iii)(A). EPA must reconsider use of the wind barrier and related obligations because EPA has failed to support the wind-speed restrictions with required and relevant analysis, has not undertaken to demonstrate that wind-barrier technology is available to be implemented at subject landfills, and has greatly underestimated the increased burden such requirements will impose on sites with low site-specific surface emission rates.

a. Lack of Scientific Basis for Wind-Speed Restrictions

In the Final Rules, EPA fails to provide a justifiable rationale for the need for wind speed restrictions and to explain why the Agency decided to lower the average permissible wind speed for conducting Tier 4 monitoring from 5 mph to 4 mph. In fact, EPA's only discussion of average permissible wind speed is borrowed from the 2015 Supplemental Proposal, in which EPA notes that the Agency included the wind speed restrictions in the Final Rules "because air movement can affect whether the monitor is accurately reading the methane concentration during surface monitoring." 81 Fed. Reg. at 59356; 81 Fed. Reg. at 59298. EPA's conclusory statement regarding the impacts of air movement on SEM is not supported and thus provides insufficient justification for lowering the Tier 4 wind speed restrictions and requiring use of wind barriers. Although EPA states that the Agency has "concerns about whether monitors could

accurately read methane concentrations or provide representative results" in windy conditions, EPA fails to provide quantitative information to confirm that the accuracy and representativeness of SEM results are compromised in windy conditions. *Id.* The closest the Agency comes to providing a technical rationale is found in EPA's responses to interagency comments in which EPA attempts to justify the wind speed restrictions by referring to best practices guidance for the Agency's leak detection and repair regulations ("LDAR") and by providing a graphic from a non-peer-reviewed web blog purporting to show a relationship between measured carbon dioxide and wind speeds. *See* EO 12866 OMB correspondence on NSPS and Emission Guidelines Reviews for MSW Landfills (EPA-HQ-OAR-2003-0215-0238), pages 1513-1514 out of 3499 (hereinafter "Interagency Response to Comments Document"). These inappropriate comparisons do not justify the wind speed restrictions in the Final Rules as they are not related to SEM at landfills and EPA has not attempted to explain how they support such restrictions.

In addition to the Agency's failure to develop evidence demonstrating the need for wind restrictions on Tier 4 monitoring, EPA's assumptions about the impacts of wind speed on SEM results is misplaced. The Final Rules require probe placement during a Tier 4 monitoring event at no more than 5 cm (2 inches) above the landfill surface, thereby making it unlikely that wind or turbulence would interfere with the monitoring device. First, there is likely to be vegetation in landfill areas that would implement Tier 4 monitoring.[15] Given the tendency for herbaceous vegetation to act as a wind barrier, increasing friction and reducing turbulence, the monitoring device would be shielded when placed as required at 5 cm (2 inches) above the surface. Second,

[15] *See generally* Daniel P. Duffy, *Layer Upon Layer – Landfill covers come in many types and configurations*, Forester Daily News (Oct. 27, 2013) (available at http://foresternetwork.com/daily/waste/layer-upon-layer/); The Interstate Technology & Regulatory Council – Alternative Landfill Technologies Team, *Technical and Regulatory Guidance for Design, Installation, and Monitoring of Alternative Final Landfill Covers* (Dec. 2003) (available at http://www.itrcweb.org/GuidanceDocuments/ALT-2.pdf); Assal Edwar Haddad, *Use of Vegetative Mulch As Daily And Intermediate Landfill Cover* (2011) (Doctoral Thesis) (available at http://stars.library.ucf.edu/cgi/viewcontent.cgi?article=3042&context=etd).

wind speeds are typically stronger at higher altitudes and weaker closer to the surface because structures, trees, vegetation and other items create barriers that slow down the wind. The fact that wind speeds increase at higher altitudes also calls into question the utility of using an anemometer that is 10 meters above the ground, as it is unlikely that wind speeds at 10 meters above the ground would provide relevant data for surface measurements. Further, the installation of a single anemometer at each landfill (many of which encompass hundreds of acres) is unlikely to be representative of wind speeds across the entire landfill, given differences in topography, and the influence of surrounding forests, fields, and physical structures.

b. Wind-Speed Restrictions Are Unduly Burdensome

In addition to failing to articulate a justifiable basis to impose wind speed restrictions on Tier 4 monitoring, EPA severely underestimates the impacts such restrictions will have on the regulated community. An analysis of wind speed data for 292 cities provides data on average annual wind speed and seasonal (or quarterly) wind speeds across the United States.[16] Los Angeles is the only city in the data set that has an average wind speed under 4 mph for all four quarters of the year. Put another way, 291 cities (or more than 99% of cities in the dataset) have average seasonal wind speeds consistently above 4 mph and would therefore be required to use a wind barrier in order to conduct Tier 4 monitoring. This analysis is consistent with the memorandum by Eastern Research Group ("ERG") on the California Landfill Methane Rule ("CA LMR"), which concludes that 72% of landfills could not comply with the CA LMR's 5 mph wind speed restriction for surface monitoring and required a permanent alternative compliance option. *See* ERG, *Analysis of Surface Exceedances from California Landfills under the New Source Performance Standards and the California Landfill Methane Rule*, 4 (July 2015)

[16] WeatherDB, "Find Average Wind Speed across the US, accessed on October 11, 2016, https://wind-speed.weather.db.com

(Docket ID EPA-HQ-OAR-2003-0215-0233). Thus, it is clear that EPA's establishment of a wind speed restriction of 4 mph will require the use of a wind barrier by almost any landfill owner/operator who intends to implement Tier 4 to demonstrate that site-specific methane surface emissions are below 500 ppm.

This profound impact is compounded by the fact that EPA has not developed a consistent methodological approach to the use of wind barriers. Although almost every landfill that uses Tier 4 will be required to employ wind barrier technology, EPA has provided no direction on how to implement the wind barrier requirement in a consistent manner across the United States. EPA has indicated that the Agency intends to provide guidance on this topic, but as of yet has failed to take required actions to ensure that this approach can be properly implemented by the regulated community. *See* 81 Fed. Reg. at 59342 and 81 Fed. Reg. at 59291 ("Although we are aware of the use of wind barriers in the field, the EPA intends to provide additional guidance on their use."). As an example of an aspect of Tier 4 that may prove unworkable in practice, Petitioners note that the requirement to place the sampling probe "no more than 5cm above the landfill surface" as based on "a mechanical device such as with a wheel on a pole" may be infeasible. 40 C.F.R. § 60.764(a)(6)(iii); 40 C.F.R. § 60.35f(a)(6)(iii). Landfills tend to have uneven surfaces covered by vegetation and other obstacles. EPA also states that the wind barrier must surround the surface emission monitor and must be placed "on the ground" to ensure that wind turbulence is blocked. *See* 81 Fed. Reg. at 59373; 81 Fed. Reg. at 59317. Petitioners are not aware of any wind barrier capable of being placed on the ground that would not also prohibit the required probe placement at no more than 5cm above the landfill surface. Petitioners also note that EPA has not demonstrated that the wind barrier is compatible with Section 8.3.1 of Method 21, which the Final Rules require Petitioners to follow to meet the Tier 4 requirements.

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See 40 C.F.R. § 60.764(a)(6)(iii); 40 C.F.R. § 60.35f(a)(6)(iii). Furthermore, Petitioners believe that use of a mechanical device on a wheel would result in the wind barrier breaking away from the monitoring setup, or damaging the analyzer probe. These concerns underscore the fact that EPA should have developed a consistent methodological approach to the use of wind barriers and demonstrated the feasibility of Tier 4 before finalizing the Final Rules.

EPA has also not provided a single piece of evidence in the Final Rules or related dockets substantiating that wind barriers will work reliably at a majority of landfills. EPA purports to have included the wind barrier requirement to allow landfills to conduct Tier 4 monitoring in windy conditions. However, the Agency has not demonstrated that the use of such barriers will provide for consistent and reliable SEM results.

EPA's 48-hour cancellation requirement is an added burden, requiring the landfill owner/operator to rely on a weather forecast 48 or more hours in advance of a planned Tier 4 monitoring event to determine if it should be cancelled due to weather conditions. 40 C.F.R. § 60.767(l)(2); 40 C.F.R. § 60.38f(m)(2). The notification requirement that EPA has inserted in the Final Rule ignores the reality that weather forecasts change often and significantly. Instead of making a timely determination whether to proceed with Tier 4 monitoring on a given day, an owner/operator may be forced to make a decision to cancel Tier 4 monitoring events two or more days before the event, simply to avoid making a weather-related cancellation less than 48 hours before the scheduled date due. Landfill owners and operators cannot be expected to predict the weather and must be given the flexibility to assess changing weather conditions prior to monitoring. But the current approach makes it significantly more likely that Tier 4 monitoring events will be delayed frequently due to uncertainty about weather conditions, thereby

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complicating the coordination efforts necessary to use Tier 4, increasing the compliance burden and potentially leading to missed quarterly monitoring events.

For all of the foregoing reasons, Petitioners request that EPA reconsider the following aspects of the Final Rules: (1) the limitation on the use of Tier 4 to landfills with modeled NMOC emission rates between 34 and 50 Mg/year; and (2) the Tier 4 wind speed restrictions and associated wind barrier requirement because these changes have altered the fundamental nature of Tier 4 in a manner that Petitioners could not have foreseen.

3. Other Tier 4 Issues

In addition to the issues previously discussed in this section, Petitioners have identified a number of other issues in the Tier 4 provisions of the Final Rules that were subject to public comment, but that EPA has failed to address and that further limit the flexibility the Agency intended to provide to landfills through the inclusion of Tier 4. We request that the Agency consider the following aspects of Tier 4 in conjunction with the reconsideration proceeding requested above.

a. Tier 4 Monitoring Procedures Should Include Corrective Action

The Final Rules do not provide a corrective action period for Tier 4 monitoring exceedances, thereby rendering Tier 4 unworkable and undercutting EPA's stated intention of encouraging the early adoption of alternative control techniques. In their comments, Petitioners urged EPA to include a single, 10-day corrective action period for each exceedance of the 500 ppm methane emission threshold. Petitioners stated that without a single, 10-day corrective action opportunity, Tier 4 would be less effective as a good predictor of the appropriate timing for GCCS installation, and that landfill owner/operators will be less likely to use Tier 4 if a

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single exceedance results in the obligation to install a GCCS. *See e.g.* NWRA & SWANA 2015 Comments at 18; WM 2015 Comments at 14-15.

Numerous states and the Small Business Advocacy Review Panel agreed with Petitioners' comments about the need for a corrective action concept to accompany Tier 4. Specifically, the Small Business Advocacy Review Panel concluded in its report on the proposed Final Rules that "Tier 4 should allow for corrective action when surface emissions above 500 [ppm] are identified, consistent with corrective action provisions for quarterly surface monitoring. Without corrective action allowances, the usefulness of Tier 4 is limited." SBARP Final Report at 7-8.

EPA has not stated a justifiable rationale for its decision to exclude from the Final Rules a 10-day corrective action period for Tier 4 exceedances. Instead, EPA explains its action with the unsubstantiated claim that a single exceedance of the "500 ppm threshold . . . would be indicative of higher emissions than would normally be expected at a landfill" and that "landfill conditions warrant installation of a GCCS." 81 Fed. Reg. at 59355. In the Agency's Response to Comments Document, EPA further explains that it is "not allowing for corrective action as part of the Tier 4 demonstration to ensure that landfills employ operational practices that minimize emissions." Response to Comments Document at 564. Such statements are simply incorrect; a single surface emission exceedance that can be corrected is most likely an indication of a localized anomaly in cover or other site-specific factors and *not relevant* to a general conclusion as to overall levels of surface emissions throughout a landfill.

EPA's explanation fails to recognize that the lack of a corrective action concept in Tier 4 will render Tier 4 impracticable to use, and will discourage the adoption of early emission reduction strategies such as oxidative covers and early gas collection and control.

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Thus, EPA must revise Tier 4 to allow for a single, 10-day corrective action period prior to requiring a landfill to begin the process of installing a GCCS.

b. The Final Rules Should Be Clarified to Address When Landfills Are Permitted to Use Tier 4

At proposal, a landfill owner/operator would have been permitted to use Tier 4 after a demonstration with Tier 1, Tier 2, *or* Tier 3 that the landfill's NMOC emission rates are above the GCCS installation threshold. *See* 80 Fed. Reg. 52102 & 52112. Under the Final Rules, however, it is unclear what emissions modeling method a landfill owner/operator must use before it may implement Tier 4 monitoring. For example, in the test methods and procedures section of the Final Rules, "Tier 4 is allowed only if the landfill owner or operator can demonstrate that NMOC emissions are greater than or equal to 34 Mg/yr but less than 50 Mg/yr using Tier 1 *or* Tier 2," suggesting that a landfill need not conduct both Tier 1 *and* Tier 2 before moving on to Tier 4, and that Tier 3 measurements are not relevant to Tier 4 implementation. 40 C.F.R. § 60.764(a)(6); 40 C.F.R. § 60.35f(a)(6). Another provision in the Final Rules, however, states that landfill owners and operators may use Tier 4 if Tier 1, Tier 2, *or* Tier 3 show a calculated NMOC emission rate between 34 and 50 Mg/year. *See* 40 C.F.R. § 60.762(b)(2) & 40 C.F.R. § 60.33f(e)(2). Adding further to the confusion, the Final Rules state that the annual Tier 4 surface emission report must include, *inter alia*, "the results of the most recent Tier 1 *and* Tier 2 results in order to verify that the landfill does not exceed 50 Mg/yr of NMOC."[17] 40 C.F.R.

[17] This provision in the Final Rules may suggest that a landfill will conduct yearly Tier 1 and Tier 2 measurements to verify that estimated NMOC emissions continue to remain between 34 and 50 Mg/year, the results of which must be included in the annual Tier 4 surface emission reports. Landfill owners and operators must not be expected to conduct annual Tier 1 and Tier 2 monitoring after a landfill has begun implementing Tier 4. A requirement to conduct annual Tier 1 and Tier 2 testing would be inconsistent with the use of Tier 4, which more accurately accounts for emissions by measuring site-specific surface methane concentrations. Furthermore, EPA has not considered the costs that would be associated with an annual obligation to conduct Tier 1 and Tier 2 tests after moving on to Tier 4. Thus, EPA must clarify that landfills using Tier 4 need not conduct annual Tier 1 and Tier 2 tests. EPA must further clarify that only the initial Tier 4 surface emission report must include the results of any Tier 1 or Tier 2 test.

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§ 60.767(c)(4)(iii); 40 C.F.R. § 60.38f(d)(4)(iii). EPA must revise the Final Rules to clarify for landfill owners and operators exactly what methods a landfill must perform prior to implementing Tier 4 monitoring.

c. The Final Rules Should Be Clarified to Address the Timing of GCCS Installation and Operation for Sources Using Tier 4

Under the Final Rules, landfills meeting the rules' design capacity thresholds are required to submit a GCCS design plan within one year of the first NMOC emission rate report in which the modeled NMOC emission rate exceeds 34 Mg/year using Tiers 1, 2, or 3, and to install and operate a GCCS within 30 months of the first NMOC emission rate report in which the modeled NMOC emission rate exceeds 34 Mg/year using Tiers 1, 2, or 3. *See* 40 C.F.R. §§ 60.762(b)(2) & 767(c); 40 C.F.R. §§ 60.33f(b)(1) & (e)(2), 38f(d). However, a landfill using Tier 4 must submit a GCCS design plan within one year of the first measured concentration of methane of 500 parts per million or greater from the surface of the landfill, and must install and operate a GCCS within 30 months of the most recent NMOC emission rate report in which the NMOC emission rate equals or exceeds 34 Mg/year based on Tier 2. 40 C.F.R. § 60.764(a)(6); 40 C.F.R. § 60.35f(a)(6). By linking GCCS installation and operation for sources using Tier 4 to the Tier 2 NMOC emission rate report rather than the triggering surface methane exceedance under Tier 4, EPA has reduced the amount of time a Tier 4 source has to install and operate a GCCS.

Under this framework, sources using Tier 4 will have less than 30 months – in some cases significantly less – to install and operate a GCCS. A landfill using Tier 4 will necessarily measure a surface methane emission exceedance *after* submitting its "most recent" NMOC emission report. For example, a landfill may measure a surface methane exceedance nearly 12 months after submittal of an NMOC report, but before a new NMOC emission report is due.

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Under this scenario, that Tier 4 source would only have around 18 months to install and operate a GCCS. Clearly EPA could not have intended this inequitable situation for Tier 4 sources, which further reduces the incentives to use Tier 4 and adopt early emission reduction strategies. Thus, EPA must revise the Final Rules to clarify that Tier 4 sources would be required to install and operate a GCCS 30 months from the date on which a surface methane exceedance of 500 ppm is measured using Tier 4.[18]

d. The Final Rules Should Clarify the Process for Submitting Annual Tier 4 Surface Emission Report

The Final Rules state that the initial Tier 4 surface emission report "must be submitted annually, starting within 30 days of completing the fourth quarter of Tier 4 surface emissions monitoring that demonstrates that site-specific surface methane emissions are below 500 [ppm] methane." 40 C.F.R. § 60.767(c)(4)(iii) & 40 C.F.R. § 60.38f(d)(4)(iii). The Final Rules further state that in the event that Tier 4 monitoring reveals a surface exceedance of 500 ppm methane, a Tier 4 surface emissions report must be submitted "within 1 year of the first measured exceedance." *Id.* It is not clear if EPA intends this to be a separate surface emission report than the one required to be submitted annually.

Petitioners urge EPA to clarify the surface emission reporting requirements for Tier 4 sources, and recommend that EPA require the initial report to be submitted following the 4th quarter of SEM, with annual submissions thereafter. Petitioners further urge EPA to allow Tier 4 sources a minimum of 60 days to submit the initial report, instead of the 30 days currently

[18] Petitioners submitted comments to EPA urging the Agency to fix inconsistencies in the proposed Final Rules as to the timing of GCCS design plan development and installation for Tier 4 sources. In the Response to Comments Document, EPA claims to have "revised the final NSPS and Emission Guidelines to make the submittal dates clear" for Tier 4 sources. Response to Comments Document at 546. However, EPA's revisions have created additional confusion and burdens for sources choosing to use Tier 4.

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included in the Final Rules. This additional time is necessary to account for the volume of information that must be included in such reports.

In addition, Petitioners believe that EPA has mistakenly included the language in the Final Rules that requires a landfill to submit a Tier 4 surface emission report within one year of a measured exceedance. Once a landfill measures surface methane concentrations above 500 ppm, Tier 4 monitoring is no longer permitted under the Final Rules, and the landfill is required to begin the process for installation and operation of a GCCS. Thus, there is no reason to submit a Tier 4 surface emission report in such a situation. Petitioners request that EPA clarify the submittal requirements for Tier 4 surface emission reports.

e. Tier 4 Recordkeeping Requirements Should Be Reduced

Under the Final Rules, landfills that employ Tier 4 must "keep for at least 5 years up-to-date, readily accessible records of all surface emissions monitoring and information related to monitoring instrument calibrations." 40 C.F.R. § 60.768(g); 40 C.F.R. § 60.39f(g). Such records must include, *inter alia*, a timestamp of "each surface scan reading . . . detailed to the nearest second, based on when the sample collection begins" and a "log for the length of time each sample was taken using a stopwatch (e.g., the time the probe was held over the area)" and the location "of each surface scan reading" showing "coordinates using an instrument with an accuracy of at least 4 meters." *Id.*

EPA has failed to articulate a basis to require such records. The obligation to maintain timestamp and location records *for all surface emission readings*, not only methane readings at or above 500 ppm, will be a significant burden. Typically, SEM is performed by a single technician. However, the timestamp and location records will increase the manpower necessary to perform SEM, increasing costs of Tier 4 and further limiting the intended flexibility the method is meant to provide to subject landfills. For example, a single technician will not be able

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to operate the surface monitoring device, a stopwatch, and a GPS device at the same time. Additionally, EPA has failed to demonstrate the availability of GPS devices with accuracy of four meters. Petitioners believe that the current practice of placing flags at monitoring locations is more accurate, and would not be improved upon by the use of a GPS device. EPA should streamline the recordkeeping requirements associated with Tier 4.

f. EPA Failed to Consider the Costs Associated With Tier 4

Despite the fundamental changes to Tier 4 that have been highlighted above, EPA has completely failed to consider the costs associated with Tier 4 in the Final Rules. A review of the Interagency Response to Comments Document shows that commenters urged EPA to consider the costs of Tier 4 in the Final Rules. EPA claimed that the Agency lacked necessary data and that "the cost to conduct a Tier 4 analysis is site specific depending on the acreage of each landfill opting to pursue Tier 4 monitoring. Due to all of these uncertainties the EPA has not costed out Tier 4." Interagency Response to Comments Document at 422 out of 3499. EPA further noted that it decided not to determine the costs of Tier 4 because Tier 4 is voluntary.

EPA's explanation that the Agency failed to consider costs because Tier 4 is a site-specific, voluntary methodology is unpersuasive. Given the prescriptive nature of the final Tier 4, it is not clear what EPA means when the Agency says that an analysis of Tier 4's costs would be site specific – all regulations have "site-specific" costs associated with their implementation. Furthermore, despite EPA's claims that the site-specific nature of Tier 4 makes quantifying costs too difficult, Petitioners have identified a number of factors EPA could and should have considered to determine the costs of Tier 4, including (1) capital costs for all newly required equipment; (2) costs for surveys, perhaps on a "per acre" basis; and (3) additional expenses associated with cancelled monitoring surveys due to wind-related issues, additional surface monitoring technicians, etc. EPA must account for the costs of Tier 4.

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B. Liquids Addition Reporting

EPA has conceded that the Agency does not have sufficient data to impose separate standards on landfills that add liquids. *See* 81 Fed. Reg. at 59345 & 81 Fed. Reg. at 59289 ("EPA did not receive sufficient data to support a separate subcategory for landfills adding leachate or other liquids."). Nevertheless, under the Final Rules, a landfill with a design capacity of 2.5 million megagrams and 2.5 million cubic meters or more that has recirculated leachate or added liquids based on a Resource Conservation and Recovery Act ("RCRA") Research, Development, and Demonstration ("RD&D") permit within the last 10 years must prepare and submit an annual report that contains voluminous information about liquids addition practices ("Annual Liquids Addition Report"). 40 C.F.R. § 60.767(k); 40 C.F.R. § 60.38(f)(l). EPA did not introduce the concept of the Annual Liquids Addition Report until the Final Rules, thus providing no notice or opportunity to comment on the new reporting requirement.

Although EPA acknowledged in both the 2014 Proposal and 2015 Supplemental Proposal that the Agency was considering the development of alternative requirements for landfills that add liquids, EPA never proposed that such landfills would be subject to additional reporting obligations under the Final Rules in the absence of substantive compliance obligations. In the 2014 Proposal, EPA solicited comments as to whether the Agency should consider reducing the design capacity threshold and/or initial lag times for landfills located in a wet climate, or that recirculate leachate or add other liquids to the landfill. *See* 79 Fed. Reg. at 41808. EPA's solicitation of comments failed to provide clear notice of what exactly EPA was considering. In the 2015 Supplemental Proposal, EPA further solicited comment on alternative design thresholds and lag times for landfills located in wet climates or that add liquids. *See* 80 Fed. Reg. at 52137-38. At no point during the notice and comment period, however, did EPA propose an annual reporting obligation exclusively for such landfills.

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Given that EPA did not provide an opportunity to comment and has acknowledged that EPA currently cannot justify separate standards for landfills that add liquids, EPA must convene a reconsideration proceeding to allow comment on this issue.

1. Annual Reporting Requirement is Unduly Burdensome

EPA appears to have based the adoption of the liquids addition reporting requirements in part on a mistaken understanding of the relative impact of the Annual Liquids Addition Report. EPA stated in the preambles to the Final Rules that "EPA believes many landfills . . . already keep [liquids addition] records and may submit reports containing quantities of liquids added. So, the effort to track these additional data is expected to be minimal." 81 Fed. Reg. at 59350; 81 Fed. Reg. at 59295. EPA is mistaken, however, as the Annual Liquids Addition Report will require Petitioners to expend significant effort that far exceeds any benefit of such report. The Annual Liquids Addition Report imposes new and extensive recordkeeping requirements that are materially different and substantially more burdensome than what is required of landfills recirculating leachate or operating bioreactor landfills pursuant to RCRA RD&D permits and Subpart HH of EPA's Mandatory Greenhouse Gas Reporting Program (40 C.F.R. Part 98).

The Annual Liquids Addition Report imposes new and extensive recordkeeping requirements in the Final Rules that are materially different than those typically required by RD&D permits. EPA estimates that approximately 30 MSW landfills operate with RD&D permits, of which WM operates five. *See* Revision to the Research Development and Demonstration Permits Rule for Municipal Solid Waste Landfills, 81 Fed. Reg. 28720-28724, 28721 (May 10, 2016) ("There are approximately 30 facilities currently operating with RD&D permits."). Thus, EPA incorrectly assumes that many landfills keep records of liquids addition pursuant to RD&D permits. Additionally, those landfills that do operate under RD&D permits are expected to provide data in a materially different manner than would be required under the

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Annual Liquids Addition Report. Based on Petitioner's experience, RD&D permits typically require a moisture balance calculation that accounts for total liquids added to the waste mass including leachate recirculated, precipitation, and leachate collected. States generally require this moisture balance to be reported by landfill phase or bioreactor cell. Because liquids are typically added at the working face of the landfill or active phase, this area tends to be a moving phase over the course of a year, making it difficult to translate into a calculation of surface area and thereby determine waste in place. Thus, the Agency's assumption that many of the data elements in the Annual Liquids Addition Report are tracked as part of a leachate management or RD&D permit is false and significantly underestimates the burdens associated with converting such data to a format that is compatible with the Annual Liquids Addition Report.

In addition, pursuant to the GHG Reporting Program, MSW landfills that exceed applicability thresholds must qualitatively report to EPA if the site recirculated leachate in the past 10-year period. Specifically, 40 C.F.R. § 98.346(a) requires an owner/operator to include in a report "an indication of whether leachate recirculation is used during the reporting year and its typical frequency of use over the past 10 years (e.g., used several times a year for the past 10 years, used at least once a year for the past 10 years, used occasionally but not every year over the past 10 years, not used)." If a subject facility did recirculate leachate in the calendar reporting year, then that site must collect data on the total volume of leachate recirculated and use this volume to determine which k-value to use for the reporting year (if applicable) according to Table HH-1 of 40 C.F.R. 98 Subpart HH.[19] Sites also report the annual waste acceptance

[19] Footnotes a and b to Table HH-1 state the following:

"[a]Recirculated leachate (in inches/year) is the total volume of leachate recirculated from company records or engineering estimates divided by the area of the portion of the landfill containing waste with appropriate unit conversions. Alternatively, landfills that use leachate recirculation can elect to use the k value of 0.057 rather than calculating the recirculated leachate rate.

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rates, along with a characterization of the waste types (e.g., MSW, construction and demolition debris, and inert materials); however, Subpart HH does not require recordkeeping or reporting of volume of leachate recirculated, surface area where leachate has been recirculated over the course of a year, or quantity of waste disposed in areas of leachate recirculation, and such data cannot be readily extracted from Subpart HH reports. Further, reporting on leachate recirculation practices only commenced with the 2010 reporting year.

Given the differences between liquids reporting pursuant to RCRA RD&D Permits and the GHG Reporting Program, EPA incorrectly assumes that landfills already keep the information required by the Annual Liquids Addition Report and as a result greatly underestimates the burdens associated with such report.

2. The Final Rules Should Not Include a Reporting Obligation That is Unrelated to Any Compliance Obligation

As discussed above, EPA has acknowledged that the Agency "did not receive sufficient data to support a separate subcategory for landfills adding leachate or other liquids," and as a result decided not to adopt separate compliance requirements for landfills that add liquids. *See* 81 Fed. Reg. at 59345; 81 Fed. Reg. at 59289. Instead, EPA states in the Final Rules that "it is appropriate to further assess emissions from wet landfills prior to taking additional action." *Id.* Thus, EPA intends for the Annual Liquids Addition Reports to "inform potential action on wet landfills in the future." *Id.* EPA should not include reporting obligations that, by EPA's own acknowledgement, are unrelated to operative requirements in the Final Rules. Such obligations are arbitrary and capricious given that they bear no relationship to the rules at issue, and are unsupported by EPA's own data.

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[b]Use the lesser value when precipitation plus recirculated leachate is less than 20 inches/year. Use the greater value when precipitation plus recirculated leachate is greater than 40 inches/year. Use the average of the range of values when precipitation plus recirculated leachate is 20 to 40 inches/year (inclusive). Alternatively, landfills that use leachate recirculation can elect to use the greater value rather than calculating the recirculated leachate rate."

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EPA's authority to promulgate recordkeeping and reporting requirements is limited by Section 114 of the CAA. Section 114 allows EPA to require reporting for the following purposes: (1) developing regulations under Sections 110, 111, 112, or 129 of the CAA; (2) determining if a regulated entity is in violation of a CAA rule; or (3) carrying out a provision of the Act. *See* 42 U.S.C. § 7414(a). Although EPA has stated that the Annual Liquids Addition Reporting requirements are intended to inform potential future action, the Agency has failed to articulate why additional information is needed, having already determined that the creation of a subcategory for landfills that add liquids is not warranted. During the notice and comment period, EPA requested information about landfills located in wet climates or that add liquids. Based on the information submitted by the numerous commenters, EPA was unable to form a basis to impose separate regulations on such landfills. *See* 81 Fed. Reg. at 59345; 81 Fed. Reg. at 59289. Given that fact, it is unreasonable to require landfills to submit data when EPA has no basis to presume that such data would support separate standards. Furthermore, EPA clearly acknowledges in the Final Rules that the Annual Liquids Addition Reports are unrelated to any compliance obligation in the Final Rules.

Given the absence of any compliance obligation for landfills that add liquids, the inclusion of a free-standing reporting obligation within the Final Rules serves no compliance purpose and therefore is inconsistent with the provisions of Section 111 and cannot be justified under Section 114. EPA has not explained how an on-going reporting obligation for landfills that add liquids is consistent with the regulatory development aspects of Section 114. Furthermore, the Annual Liquids Addition Report is unnecessary given EPA's efforts to

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comprehensively address landfills that add liquids in the Agency's forthcoming revisions to RCRA Subtitle D, Part 258.[20]

On reconsideration, EPA should remove the Annual Liquids Addition Report from the Final Rules.

C. Corrective Action Timeline Procedures

In the 2015 Supplemental Proposal EPA requested comments on the submittal of corrective action timelines. However, EPA's proposal did not include a specific schedule for submitting alternative timeline requests because EPA believed that investigating and determining the appropriate corrective action, as well as the schedule for implementing that corrective action, should be site specific and depend on the reason for exceedance. *See* 80 Fed. Reg. at 52126. In their comments, which addressed this subject, Petitioners agreed with EPA that corrective action schedules should be site specific.

However, the Final Rules contain a highly complex and prescriptive schedule for corrective action. The mandated schedule generally gives owners or operators only 60 days to investigate, determine appropriate corrective action, and implement the corrective action. If an exceedance cannot be corrected within 15 days, then a root cause analysis must be conducted within 60 days of the initial exceedance. Further, an implementation schedule is required for exceedances that will take longer than 60 days to complete the corrective action(s) as soon as practicable, but no more than 120 days. The regulatory provision that EPA adopted in the Final Rules to require this particular schedule for corrective action was not available for comment.

[20] In July 2016, EPA announced that the Agency will be requesting "information and data on the performance of wet landfills." EPA, 2016 Regulatory Agenda (available at http://www.reginfo.gov/public/do/eAgendaviewRule?pubId=201604&RIN=2050-AG86).

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The original landfill rules (40 C.F.R. Subparts WWW and Cc) require the landfill owner/operator to take corrective action for exceedances on a set schedule and request alternative timelines as needed. The Final Rules, however, differ in that the schedule is far more complex and now require a root cause analysis and submission of a corrective action plan—new elements that EPA has never required previously and that were not included in any of EPA's proposals. *See* 40 C.F.R. § 60.765(a)(3)&(5); 40 C.F.R. § 60.36f (a)(3)&(5).

Rather, EPA's new complex corrective action requirements and procedure actually appear to be a response to a comment submitted by Republic, asking for an entirely different corrective action procedure, one that eliminates the approval process altogether to avoid the concerns that arise when EPA and states fail to issue their approval in a timely manner. Although Republic supported an approach that would include a root cause analysis and reporting of certain events, Republic did not support any requirement for the submission of corrective action plans for approval. *See* Republic 2015 EG Comments at 13. Thus, the corrective action requirements in the Final Rules are entirely new—the approach was never proposed by EPA or any commenter. Moreover, EPA's Final Rules do not address the primary focus of Petitioners' comments on the corrective action process—*i.e.*, Petitioners' concern that many alternative timeline requests are never approved because of a lack of agency review.

Because EPA provided no notice of its new corrective action requirements and procedure in any proposal, Petitioners could not have commented on it, and EPA's lack of notice constitutes a violation of its rulemaking requirements under the CAA. In addition, because the corrective action component is the primary compliance obligation imposed on landfills to ensure emissions are minimized through good operation of a gas collection and control system, the requirement is clearly of central relevance to the outcome of the Final Rules. Therefore,

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Petitioners respectfully request that EPA reconsider its new corrective action requirements and procedure to allow Petitioners and the general public an opportunity to comment on it.

As part of the reconsideration proceeding, EPA should evaluate whether preparation of a root cause analysis and submission of a corrective action plan is necessary over and above simply reporting temperature or negative pressure events, as already required under the existing provisions of Subparts WWW and Cc. The root cause and corrective action plan creates additional recordkeeping burden that should only be added if EPA can demonstrate that it will achieve meaningful air qualify benefits. Background documents in the Interagency Response to Comments Document confirm that the approach proposed by Petitioners, not the approach finalized by EPA, would provide the EPA with sufficient assurances that timely and appropriate measures are taken to avoid hazards, such as landfill fires. Conversely, EPA has not yet demonstrated that its new requirements and procedure are needed to ensure proper operation of GCCS or provide any environmental benefits.

EPA should also reevaluate the costs of its new corrective action procedures, given that the Agency failed to conduct an adequate cost analysis as part of the Final Rules. Specifically, EPA appears to have underestimated the number of root cause analyses that its new provision will require. The EPA claims it does not have enough data to estimate how many landfills would need to conduct the root cause analysis each year, but even a cursory and conservative review of data that EPA references in the Interagency Response to Comments Document suggests one exceedance per year per landfill will likely require corrective action and root cause analysis. EPA should therefore review information from the existing program to provide an expected number of reportable incidents, the number of incidents likely to be resolved within the 15 day time period, the number of incidents likely to require a root cause analysis and corrective action

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application, and the usual time (for State and Federal regulatory authorities separately) for approval and/or response to such application. During the reconsideration proceedings, EPA must accurately reflect the costs associated with the new corrective action procedures.

V. Petition for Administrative Stay of the Final Rules Pending Judicial Review

Petitioners respectfully request an immediate stay of the Final Rules. Pursuant to Section 705 of the APA, EPA may postpone the effective date of a regulation pending judicial review where "justice so requires." 5 U.S.C. § 705. EPA has expressly recognized that the Agency has broad authority under Section 705 of the APA to grant an administrative stay pending judicial review of a final rule that EPA has promulgated pursuant to the CAA.[21] Petitioners are simultaneously filing petitions for review of the Final Rules in the D.C. Circuit, and justice requires that the Final Rules be immediately stayed given the significant substantive and procedural flaws that have been identified in Sections III and IV of this Petition, which have rendered the Final Rules unworkable and unsupportable as presently constituted.

In considering motions to stay pursuant to APA Section 705, the D.C. Circuit considers the following four factors: (1) the likelihood that the party seeking the stay will prevail on the merits of the appeal; (2) the likelihood that the moving party will be irreparably harmed absent a stay; (3) the prospect that others will be harmed if the court grants the stay; and (4) the public interest in granting the stay. *See Cuomo v. U.S. Nuclear Regulatory Comm'n*, 772 F.2d 972, 974 (D.C. Cir. 1985). EPA must consider the same set of factors when deciding to grant a stay

[21] *See* EPA, *Industrial, Commercial, and Institutional Boilers and Process Heaters and Commercial and Industrial Solid Waste Incineration Unit – Final rules; Delay of effective dates*, 76 Fed. Reg. at 28662-28664, 28663 (May 18, 2011) ("EPA notes that it is delaying the effective date of the Major Source Boiler MACT and the CISWI Rule pursuant to the APA, rather than section 307(d)(7)(B) of the Clean Air Act. As explained above, the APA authorizes the EPA to find that justice requires postponing the effective date of a rule when litigation is pending."); see also *Sierra Club v Jackson*, 833 F. Supp. 2d 11, 24 (D.D.C. 2012) ("While the Clean Air Act establishes the process by which either EPA or a court may stay the effectiveness of a rule pending reconsideration, it does not by its terms or by logical implication limit the authority of either an agency or a court to exercise its traditional statutory authority under Section 705 of the APA to stay such rules or regulations pending judicial review.").

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pursuant to APA Section 705. *Sierra Club*, 833 F. Supp. 2d at 50-51. Petitioners submit that the grounds for an administrative stay of the Final Rules pending judicial review are compelling in this instance and satisfy the statutory requirements for a stay under APA Section 705.

The Final Rules present precisely the circumstances in which an administrative stay pending judicial review is warranted given the significant regulatory uncertainty caused by the substantive and procedural errors in the Final Rules that have been discussed throughout this Petition. EPA's failure to address the overlapping applicability issues, identified in Section III.A, above, is perhaps the best example of how EPA's errors warrant an administrative stay pending juridical review. First, Petitioners are likely to prevail on the merits in challenging the Agency's unreasonable failure to address the overlapping applicability of the old subparts (WWW and Cc), the new subparts (XXX and Cf), and the Landfill NESHAP because the Final Rules are directly contrary to EPA's stated intent and contrary to CAA Section 111 definitions of "new" and "existing" sources by regulating many landfills as both. Second, Petitioners will incur irreparable harm as a direct result of the Agency's failure to resolve the overlapping applicability of the various standards because Petitioners will be forced to simultaneously comply with different and overlapping provisions from either the new or old subparts, forcing Petitioners to engage in two different sets of activities to ensure compliance with the old and new subparts. Thus, Petitioners will be forced to comply with both the old and new subparts without obtaining any benefit from the regulatory provisions that EPA intended to update and streamline with the Final Rules, and the losses that will result will not be recoverable from EPA in any legal proceeding. Third, no party will be harmed by EPA's decision to grant a stay of the Final Rules pending judicial review because Subparts WWW and Cc (and the state plans implementing Subpart Cc) will remain in effect, thereby ensuring that landfills continue to operate their GCCS

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and meet the other operational standards of the old subparts, many of which have been carried over into Subparts XXX and Cf. Fourth and finally, granting the stay is within the public interest because, as noted above, EPA's intention to update and streamline the applicable Section 111 standards for MSW landfills has been undercut by the Agency's failure to enact appropriate applicability provisions in the Final Rules.

For all of the forgoing reasons, Petitioners respectfully request that EPA administratively stay the Final Rules rule pending judicial review.

Respectfully submitted,

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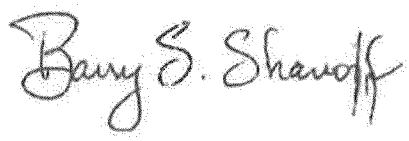

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APPENDIX A

January 22, 2016

Via Electronic Transmission: ward.hillary@epa.gov
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Re: Docket ID No. EPA-HQ-OAR-2003-0215
Docket ID No. EPA-HQ-OAR-2014-0451

Dear Hillary,

The undersigned organizations representing both private and public landfill owners and operators offer the following supplemental comments to those our organizations have already submitted. After reviewing the comments submitted in response to the U.S. Environmental Protection Agency's (EPA or Agency) Supplemental Proposal for the New Standards of Performance (NSPS) for Municipal Solid Waste (MSW) Landfills and the Proposed Emission Guidelines (EG), we thought it might be helpful to you to clarify and re-emphasize some of the key points made in our earlier comments and reiterated by state officials and other organizations. We understand that the Agency is not required to consider these supplemental comments, as the comment period has closed. Nonetheless, we hope the Agency finds this document useful, and we appreciate your consideration of our supplemental comments as you work towards finalizing the rules.

We Strongly Support EPA's Proposed Removal of the Wellhead Operating Parameters for Temperature and Oxygen/Nitrogen, while maintaining Monthly Monitoring and Recordkeeping

Our organizations are very supportive of the EPA's proposal to eliminate the wellhead parameters for temperature, oxygen/nitrogen and rely on landfill surface emissions monitoring (SEM) requirements in combination with maintenance of negative pressure at wellheads to indicate proper operation of the gas collection and control system (GCCS) and minimize surface emissions.

In our comments, we described our concerns with required wellhead parameters that are counterproductive to optimally operating our gas collection and control systems and reducing emissions. For many years, these wellhead parameters have been among the most significant barriers to earlier installation of gas collection and control measures and in some cases to adequate surface emissions and migration control. We provided numerous examples of state agency determinations as illustrative examples. (See Waste Management Comments on Proposed XXX and ANPRM for EG, September 15, 2014, pg. 24-25, NWRA-SWANA Comments, September 15, 2014, pg. 7-8)

Our nearly two decades of experience implementing Subparts WWW and Cc has demonstrated that the temperature and oxygen/nitrogen parameters are poor indicators of landfill fires or inhibited waste decomposition. To comply with the arbitrary temperature and/or oxygen parameters, sites must often reduce landfill gas (LFG) flow to the affected well, thereby decreasing system performance and increasing potential emissions. Conforming to the wellhead operating parameters imposes significant administrative burdens on both regulatory agencies and the regulated community.

In reviewing the comments received by the Agency, we noted that the National Association of Clean Air Agencies (NACAA), which represents air pollution control agencies in 40 states, DC, four territories and 116 metropolitan areas, also supported eliminating the temperature and oxygen/nitrogen parameters. Additionally, the majority of state agencies and public organizations submitting separate comments including Colorado, Delaware, Georgia, Minnesota, Ohio, four Wisconsin county agencies, and the U.S. Small Business Administration (SBA) all supported eliminating the wellhead parameters for temperature and oxygen/nitrogen.

Several states were silent regarding the EPA's proposal, but strongly supported continued monitoring and recordkeeping of temperature and oxygen/nitrogen data. We also support continued monitoring and recordkeeping for those parameters. Several state commenters raised concerns they would no longer know if a landfill fire occurred; however, the rule requires landfills to report instances when positive pressure occurs in the wells and gas extraction system to avoid a fire. We also believe the Agency could alleviate some state agency concerns by requiring that the monitoring records be kept onsite and available for inspection, and that information suggested by NACAA and the State of Delaware (reporting of oxygen values exceeding 5% and temperature exceedances of 130 degrees F) be included in the facilities' semi-annual reports for informational purposes.

We Support EPA's Proposal with Recommended Amendments to use Tier 4 as an Alternative Approach to Determine when a Landfill must Install and Operate a GCCS, and when a Landfill can Cap or Remove GCCS due to Declining Flow

We strongly support the Agency's proposed use of Tier 4 as an alternative, site-specific emission measurement to determine the appropriate timing for installing and operating a GCCS. We believe that a SEM option will enhance decision-making regarding the timing and approach for controlling landfill gas emissions, and will incentivize sites to implement methane reduction practices as quickly as possible. EPA's proposal to allow use of Tier 4 SEM for landfills looking to cap or remove GCCS due to declining flow is also a welcome approach.

Providing landfill sites with the option to conduct a Tier 4 will more accurately identify changes in gas generation attributable to climate differences, waste age and composition, and other factors and avoids a "one-size-fits-all" with respect to when gas collection is warranted. This will be even more important into the future as we see greater diversion of organics from landfills. In addition, we expect use of a measurement-based approach, as opposed to modeling, will provide a more reliable assessment of emission fluxes, which is particularly important in cases where the results of the available models appear flawed.

All of the undersigned organizations recommended that the Agency's Tier 4 approach be modified to allow for a single, ten-day corrective action period to remedy each exceedance of the 500 part per million (ppm) threshold detected during a Tier 4 monitoring event.

We also urged EPA to delete the specific wind speed criteria and maintain the current Subpart WWW surface monitoring provisions for the performance of Tier 4 (i.e., "typical meteorological conditions").

The comments from states and other public organizations overwhelmingly supported the proposed Tier 4 to determine the appropriate timing for installation and removal of GCCS. The public entities included NAACA, and the States of Delaware, Iowa, Kentucky, New Mexico, Ohio, Oklahoma and

Pennsylvania, the Palm Beach Solid Waste Authority, four counties in Wisconsin, the Texas SWANA chapter and the SBA. The Environmental Defense Fund also commented in support of Tier 4, although they recommended a lower threshold than EPA proposed. The public organizations all supported the EPA proposed threshold of 500 ppm, and elimination of the wind speed limit on use of Tier 4. NACAA and the state and local government commenters discussed the potential implementation barrier the wind speed requirement would pose for using Tier 4. The vast majority of the public organizations, including NACAA also commented in favor of EPA including a brief, one-time corrective action period (e.g., ten-day) to remedy exceedances that can be addressed with simple corrections to landfill cover, or adjustments of the existing GCCS.

We Strongly Support EPA's Proposed Subcategory for Closed Landfills

The undersigned organizations continue to support the proposed subcategory for closed landfills and the proposed expansion of the subcategory to include landfills that close (cease accepting waste) within 13 months after publication of the final EG rules in the Federal Register. It is critical that landfill owners that are planning to cease accepting waste have the necessary time to meet all of the criteria and submit the necessary documentation for a "closed landfill" designation. Closed landfills that are required to control emissions under the existing EG or NSPS WWW would continue to operate the facilities, including GCCS, and reduce emissions in accordance with these rules.

In our review of the comments, none of the 15 state and local regulatory agencies that submitted formal comments, opposed the proposed closed landfill subcategory, nor did NACAA in its formal comments. The Pennsylvania Department of Environmental Protection (PA DEP) and the SBA affirmatively supported the closed landfill subcategory. PA DEP recommended that EPA expand the closed landfill subcategory to allow MSW owners to close within 13 months of final rule publication. The Small Business Administration stated that EPA should allow more landfills to close up until the state or Federal regulations implementing the revised EG are effective, particularly as EPA provided no practical notice to entities when they proposed the closed landfill subcategory that the cut-off date would be 7/17/2014.

Based on gas generation model results for closed landfills that report emissions to federal GHG reporting program, we estimate the proposed change to reduce non-methane organic compound (NMOC) threshold from 50 Mg to 40 Mg will prolong the requirement to operate GCCS another five years, and impose significant costs on landfills at the end of life. Reducing the threshold to 34 Mg/year will prolong operations by eight years.

Many closed landfills struggle to maintain sufficient gas flow to operate their control systems under the 50 Mg/year threshold. At a lower NMOC threshold, landfill owner/operators will need to use increasing amounts of fossil fuel to maintain flare operation. This increases GHG emissions, which conflicts with the Administration's Methane Reduction Plan.

Closed landfills do not generate revenue and many are owned by municipalities, which must pass new costs on to their local taxpayers. Closed site compliance costs are formulated based on settled expectations that new requirements (i.e., lower NMOC threshold) will not be triggered in the absence of a reopening or an expansion. Absent the proposed subcategory, including the 13-month timeframe expansion, closed landfill facilities will face significantly increased compliance costs and administrative burdens.

We Support Streamlining the Design Plan Approval and Update Process

Our organizations supported EPA's conclusion that review and approval of design plans is clearly a burden for many states. Two of our organizations, Waste Management and Republic Services, estimated that only 40 percent of their landfills operate pursuant to an approved design plan, and together the two companies own and operate about 50 percent of the MSW landfills in the U.S. Given this track record, we strongly support the Agency finalizing a process that eliminates the need for state approval of plans, which is a system that has simply not worked. Instead, state and local agencies and landfill owner/operators should be allowed to obtain and rely upon third-party professional engineer (PE) certification of design plans and revisions in lieu of an agency approval process. Certified plans may be maintained onsite for inspection and/or submitted to the implementing agency.

Subpart WWW in discussing design plan approval in Section 60.752 states, "*Because of the many site-specific factors involved with landfill gas system design, alternative systems may be necessary. A wide variety of system designs are possible, such as vertical wells, combination horizontal and vertical collection systems, or horizontal trenches only, leachate collection components, and passive systems.*" No other NSPS rule includes such a statement about site-specific design variables, and this statement supports need for the PE review and certification rather than relying on agency staff unfamiliar with the highly site-specific nature of GCCS design.

A process that relies on independent PE certification would reduce administrative burdens on state agencies, while offering greater regulatory certainty for the regulated community and public. Further, use of state-licensed PEs would simplify the process. Landfill owner/operators have ready access to third-party PEs, who have the requisite experience and expertise in GCCS design, and state certification boards exist to oversee and license PEs.

The vast majority of the state organizations that commented on EPA's proposal for third-party verification of plans, including NACAA, opposed the proposal as we did. Most described third-party verification as expensive, burdensome and unnecessary. While a number of states were loath to give up their design plan approval authority saying it does not pose a burden, the nationwide record of implementing approvals does not support their argument.

Furthermore, EPA and the delegated state agencies' primary oversight of the GCCS system is not at the design plan stage, but rather through the permitting process when a landfill has triggered the need to install a GCCS. Landfills must apply to the regulators for a construction permit, and the state agency must permit control devices associated with the GCCS. This permitting authority gives states the best opportunity for oversight and approval. It is through permitting, as well as required wellhead pressure monitoring, surface emission monitoring, remediation of exceedances and required documentation of GCCS "as-built" conditions (all contained within required semi-annual reports), not review and approval of a conceptual design, which provides regulators ample oversight mechanisms to ensure GCCS is properly installed and operated.

There is significant precedent for submission of site-specific regulatory plans with no requirement for Agency approval. In fact, the proposal to require Agency approval of the both the design plan and treatment system monitoring plan is inconsistent with numerous federal rules that instead require copies (of management, monitoring or operating plans) to be submitted to the agency (no approval required) and/or maintained on site for agency inspection:

- 40 C.F.R. 98 Subpart A– GHG Mandatory Reporting Rule (GHG monitoring plan)
- 40 C.F.R. 60 Subpart Ec – HMIWI (waste management plan)
- 40 C.F.R. 60 Subpart F – Portand Cement Plants (monitoring plan)
- 40 C.F.R. 60 Subpart Ja – Petroleum Refineries (flare management plan)
- 40 C.F.R. 60 Subpart Ka – Storage Vessels (operations and maintenance plan)
- 40 C.F.R. 60 Subpart Y – Coal Preparation and Processing Plants (fugitive dust emissions control plan)
- 40 C.F.R. 60 Subpart GG – Stationary Gas Turbines (parameter monitoring plan)
- 40 C.F.R. 60 Subparts VV, VVa – Equipment Leaks SOCMI (monitoring and inspection plans for pumps, valves, closed vent systems)
- 40 C.F.R. 60 Subpart AAA – Residential Wood Heaters (Manufacturer's Quality Assurance Plan: note this plan is third-party certified)
- 40 C.F.R. 60 Subpart QQQ – Petroleum Refinery Wastewater Systems (plans/specification for various component or system design)
- 40 C.F.R. 60 Subpart AAAA – Small MWC Units (materials separation plan)
- 40 C.F.R. 60 Subpart CCCC – CISWI (waste management plan)
- 40 C.F.R. 60 Subpart DDDD – CISWI EG model rule (control plan, waste management plan)
- 40 C.F.R. 60 Subpart EEEE – OSWI (waste management plan)
- 40 C.F.R. 60 Subpart FFFF – OSWI EG Model rule (waste management plan)
- 40 C.F.R. 60 Subpart IIII – Stationary Compression Ignition Internal Combustion Engines (maintenance plan)
- 40 C.F.R. 60 Subpart JJJJ– Stationary Spark Ignition Internal Combustion Engines (maintenance plan)
- 40 C.F.R. 60 Subpart KKKK – Stationary Combustion Turbines (quality assurance plan, parametric monitoring plan)
- 40 C.F.R. 60 Subpart LLLL – Sewage Sludge Incineration Units (fugitive emissions monitoring plan)
- 40 C.F.R. 60 Subpart MMMM – SSIU EG Model Rule (control plan)
- 40 C.F.R. 60 Subpart OOOO – Crude Oil and Natural Gas Production, Transmission and Distribution (inspection and maintenance plan)
- 40 C.F.R. 60 Subpart QQQQ - Residential Hydronic Heaters and Forced-Air Furnaces (Manufacturer's quality assurance plan: note this plan is third-party certified)
- 40 C.F.R. 60 Subpart TTTT – GHGs for EGUs (monitoring plan)
- 40 C.F.R. 63 Subpart A – General NESHAPs Provisions (SSM plan)
- 40 C.F.R. 63 Subpart EEE – Haz Waste Combustors (emergency safety vent operating plan, Operations and Maintenance Plan, Feedstream analysis plan)
- 40 C.F.R. 63 Subpart HHH – Natural Gas Transmission and Storage (inspection and maintenance plan for control devices, site-specific monitoring design, data collection, and QA plan for monitoring control device)
- 40 C.F.R. 63 Subpart LLL: Portland Cement (site specific monitoring plan
- 40 C.F.R. 63 Subpart OOO: Manufacture of Amino/Phenolic Resins (monitoring plan for leak detection, gas stream flow determination plan)
- 40 C.F.R. 63 Subpart QQQ: Primary Copper Smelting (Operations and maintenance plan for each capture and control device)
- 40 C.F.R. 63 Subpart RRR: Secondary Aluminum Production (operations, maintenance and monitoring (OM&M) Plan for capture/control systems)

- 40 C.F.R. 63 Subpart TTT: Primary Lead Smelting (corrective action plan)
- 40 C.F.R. 63 Subpart VVV: POTWs (inspection and monitoring plan to comply with the standard)
- 40 C.F.R. 63 Subpart XXX: Ferroalloys Production (process fugitive ventilation design plan, outdoor fugitive dust plan, site-specific monitoring plan for CMS)
- 40 C.F.R. 63 Subpart GGGG: Solvent Extraction for Vegetable Oil Production (plan for demonstrating compliance)
- 40 C.F.R. 63 Subpart HHHH: Wet-formed Fiberglass Mat Production (OM&M Plan, performance evaluation plan)
- 40 C.F.R. 63 Subpart IIII: Surface Coating of Automobile and Light Duty Trucks (work practice plan to minimize HAP emissions)
- 40 C.F.R. 63 JJJJ: Paper and Other Web Coating (site-specific monitoring plan for capture system and control device; inspection and maintenance plan for catalytic oxidizer)
- 40 C.F.R. 63 Subpart KKKK: Surface Coating of Metal Cans (Work practice plan; inspection and maintenance plan for catalytic oxidizer)
- 40 C.F.R. 63 Subpart MMMM: Surface Coating of Miscellaneous Metal Parts and Products (work practice plan, site-specific inspection and maintenance plan for catalytic oxidizer)
- 40 C.F.R. 63 Subpart NNNN: Surface Coating of Large Appliances (work practice plan, site-specific inspection and maintenance plan for catalytic oxidizer)
- 40 C.F.R. 63 Subpart OOOO: Printing, Coating, and Dyeing of Fabrics and Other Textiles (work practice plan, sampling plan, and site-specific inspection and maintenance plan for catalytic oxidize, capture system monitoring plan)
- 40 C.F.R. 63 Subpart PPPP: Surface Coating of Plastic Parts and Products (work practice plan, site-specific inspection and maintenance plan for catalytic oxidizer)
- 40 C.F.R. 63 Subpart QQQQ: Surface Coating Wood Building Products (work practice plan, site-specific inspection and maintenance plan for catalytic oxidizer)
- 40 C.F.R. 63 Subpart RRRR: Surface Coating of Metal Furniture (work practice plan, site-specific inspection and maintenance plan for catalytic oxidizer)
- 40 C.F.R. 63 Subpart SSSS: Surface Coating of Metal Coil (capture system monitoring plan, site-specific inspection and maintenance plan for catalytic oxidizer)
- 40 C.F.R. 63 Subpart TTTT: Leather finishing (Compliance demonstration plan)
- 40 C.F.R. 63 Subpart UUUU: Cellulose Products (site specific monitoring plan for CMS)
- 40 C.F.R. 63 Subpart VVVV: Boat Manufacturing (implementation plan for open molding operations)
- 40 C.F.R. 63 Subpart ZZZZ: Stationary RICE (site-specific monitoring plan for CPMS, maintenance plan)
- 40 C.F.R. 63 Subpart FFFFF: Integrated Iron and Steel (Operations and maintenance plan,63.7834)
- 40 C.F.R. 63 Subpart JJJJJ : Brick and Structural Clay Products Manufacturing (Operation, Maintenance and Monitoring Plan)
- 40 C.F.R. 63 Subpart KKKKK: Clay Ceramics Manufacturing (Operation, Maintenance and Monitoring (OM&M) Plan)
- 40 C.F.R. 63 Subpart LLLLL: Asphalt Processing and Roofing Manufacturing (site-specific monitoring plan)
- 40 C.F.R. Subpart PPPPP: Engine Test Cells (inspection and maintenance plan)
- 40 C.F.R. 63 Subpart SSSSS: Refractory Products Manufacturing (OM&M Plan)
- 40 C.F.R. 63 Subpart TTTTT: Primary Magnesium Refining (operations and maintenance plan)

- 40 C.F.R. 63 Subpart UUUUU: Coal and Oil-fired EGUs (site specific monitoring plan 63.10000(d))
- 40 C.F.R. 63 Subpart BBBBBB: Gasoline Distribution bulk terminals, plants, and pipeline facilities (monitoring and inspection plan)
- 40 C.F.R. 63 Subpart QQQQQQ: Wood preserving area sources (management practice plan)
- 40C.F.R. 63 Subpart VVVVVV: Chemical Manufacturing area sources (monitoring plan, includes O&M for control device)
- 40 C.F.R. 63 YYYYYY: Ferroalloys Production facilities for area sources (site-specific monitoring plan)
- 40 C.F.R. 63 AAAAAAA: Asphalt Processing and roofing manufacturing area sources (site specific monitoring plan)

Despite the numerous regulatory precedents noted above, should EPA decide to maintain the requirement that state agencies approve design plans and revisions, we strongly recommend that the Agency incorporate language that provides for automatic approval of plans should a state agency fail to approve or disapprove a plan or revision in writing within 90 days. A precedential example can be found at 40 C.F.R. 63 Subpart MMM Pesticide Active Ingredient Production, which provides the Agency 90 days to approve or disapprove a "precompliance plan" before it is deemed approved.

We Strongly Support the EPA's Proposed Definition of Landfill Gas Treatment Systems, but Oppose Proposed Agency Approval of Treatment Plans

We support the Agency's proposed definition of landfill gas, treatment system and believe it supports and promotes projects for beneficial use of landfill gas. However, we oppose the proposal to require agency approval of the treatment system, monitoring plan as part of the GCCS Design Plan. The requirement would create a new and unwarranted burden for the agencies, especially since the treatment systems are site-specific, tailored to the end user specifications, and highly technical.

The Agency proposal is inconsistent with the federal rules listed above, which merely require copies (of management, monitoring or operating plans) be submitted to the agency or maintained on site for agency inspection.

The landfill gas, treatment systems are not subject to emission limits or continuous emissions monitoring, yet EPA proposes to require agency approval, which is more stringent than what EPA has required for sources with actual HAP emission limits and continuous emissions monitoring requirements. We recommend EPA finalize a requirement to prepare a treatment system, monitoring plan and maintain a copy on site for agency inspection as has been promulgated in so many other NSPS and NESHAP rules.

Peer Reviewed Data Show Landfill Gas Collection Efficiencies Ranging from 75 Percent to Over 95 Percent are Defensible

In response to the draft NSPS for landfills, the EPA received comments regarding the collection efficiency of GCCSs. Collection efficiency is an important factor used in calculating the emissions of NMOCs, volatile organic compounds (VOCs), and greenhouse gases (GHG) from landfills. Docketed comments on the proposed NSPS/EG rules (see EPA-HQ-OAR-2014- 0451 and EPA-HQ-OAR-2003-0215) mention collection efficiency at landfills is lower than recent data suggest. Specifically collection efficiencies could be as low as 20 percent (Sierra Club), or 35 percent (ERC, Covanta).

We have reviewed these comments and determined that they do not provide a representative picture of the collection efficiency seen at most landfills operating with current industry state-of-the-practice systems and procedures, specifically those used for compliance with the NSPS/EG.

Inadequacy of Cited Studies

The studies cited by the Sierra Club, ERC, and Covanta do not support claims that typical methane capture is as low as 20 or 35 percent. The studies are not representative of collection systems operated in compliance with the current and proposed MSW Landfill NSPS or EG rules.

Sierra Club Sources

The Sierra Club letter suggests that lifetime LFG collection rates are as low as 20 percent. They reference the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (FAR), which states, "Some sites may have less efficient or only partial gas extraction systems and there are fugitive emissions from landfilled waste prior to and after the implementation of active gas extraction; thus estimates of 'lifetime' recovery efficiencies may be as low as 20%." However, it is clear in the FAR that the 20 percent lifetime recovery rate is not referring to a NSPS compliant system. The FAR estimates collection efficiencies across a broad range of landfills worldwide from highly developed countries with stringent landfill standards (e.g., the U.S.) and far less developed countries with no sanitary landfills or landfill regulatory standards.

The Sierra Club also cites comments from Hans Oonk in the "Expert Review of First Order Draft of Waste Chapter to IPCCS Fourth Assessment Report"; however, his comments confirm that the low end of the gas capture range is not comparable to the collection efficiency achieved at landfills regulated under the current NSPS. He evaluated performance of gas collection systems that were installed at Dutch landfills, not for regulatory purposes, but only to recover gas for energy. Hans Oonk concluded that LFG collection for energy recovery coupled with the requirement to flare additional LFG is a highly effective option for controlling LFG emissions. This hybrid energy and flare system is the industry standard throughout the United States.

Furthermore, lifetime emissions of 80 percent of the gas from a landfill as posited by Covanta, ERC and Sierra Club would almost certainly make compliance with the NSPS/EG impossible. Such high emission rates would result in methane detections during required surface monitoring, and in turn requiring corrective action and expansion of the GCCS to lower surface emissions. Even absent the regulatory requirements for monitoring, the emissions would likely result in significant odors and complaints to local agencies.

The Sierra Club letter claims, "no gas collection can be functional until later when the cell is full and low permeable [sic] final cover is installed." In fact, hundreds of landfills have placed waste in areas with existing gas collection. While this practice may require gas systems to undergo repair, the Sierra Club's claims that "gas collection is also not functional prior to the installation of the final cover," is simply wrong, and lacks a fundamental understanding of how GCCSs are design, installed, operated, and expanded as landfills grow.

The 20 percent recovery value cited in these comments is not representative of U.S. landfills. It may be representative of the average of unregulated landfills worldwide as part of the low end of the range of collection efficiencies, but federal and state landfill requirements results in significantly higher collection efficiency rates at U.S. landfills.

Covanta and ERC Sources

The Covanta and ERC letter cites five sources for the range of collection efficiencies, including:

1. Environmental Commissioner of Ontario, EcoIssues: GHG11 Landfill Methane, http://ecoissues.ca/GHG11_Landfill_Methane
2. Fischedick M. et al. (2014) Climate Change 2014: Mitigation of Climate Change, Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
3. Levis, J., M.A. Barlaz (2014) Landfill Gas Monte Carlo Model Documentation and Results,
4. CalRecycle 2012, Review of Waste-to-Energy and Avoided Landfill Methane Emissions.
5. Documentation for Greenhouse Gas Emission and Energy Factors Used in the Waste Reduction Model (WARM)

We have reviewed each of the cited sources for its appropriateness and representativeness for determining the collection efficiency of landfills in the United States subject to the NSPS/EG.

The first of these citations is a website for the Environmental Commissioner of Ontario (ECO). The ECO cites some studies of LFG collection efficiency and concludes that the default collection efficiency of 75 percent used by the EPA and others is overstated (note: landfills in Canada are not subject to the more stringent requirements of the NSPS/EG). However, the ECO also notes that the IPCC states that LFG collection could be above 90 percent. We note that the comments by Sierra Club, ERC and Covanta omitted the upper end of the range of landfill collection efficiencies cited by the same sources they reference.

The second source (Fischedick M. et al.) states that methane collection efficiencies range from 50 percent to 95 percent. The low collection efficiency rate of 50 percent is appropriate for some landfill collection systems that are not designed for compliance with the NSPS/EG, but are operated to achieve odor control or mitigate LFG migration. However, this type of system is typically found at small or closed landfills that account for a relatively small amount of GHG emissions, and where a comprehensive GCCS would be cost prohibitive.

The third citation (Levis and Barlaz) uses models to analyze methane recovery from different waste types under varied landfilling conditions. While the study indicated that over 80 percent of methane could be emitted, this low methane recovery rate applied to only one waste type (grass clippings), which is a rapidly degrading waste disposed in a bioreactor landfill. Further, the 80 percent emission rate is a worst-case, lifecycle scenario, in a modeled situation with delayed collection. Overall, the methane recovery rate for landfills in the model scenarios for landfills receiving more than 110 centimeters of precipitation per year were greater than 60 percent, and greater than 70 percent for landfills receiving less than 110 centimeters of precipitation per year.

The fourth citation (CalRecycle) is a study of a single landfill in California, which was subject to neither the federal NSPS/EG nor the California AB 32 Landfill Methane Rule (LMR). It is therefore inappropriate to apply conclusions from this single site study to sites complying with NSPS and the LMR. In fact, quite the opposite, this study provides support for why the NSPS/EG rule can be effective at reducing LFG emissions as compared to unregulated conditions.

The fifth citation (WARM guidance) draws on some of the same work as the Levis and Barlaz study discussed above. The WARM guidance determined that better than 50 percent LFG recovery was

typical for the national average for most waste types with yard trimmings being the exception. This value in the WARM guidance does not support assertions of a LFG recovery rate as low as 35 percent being representative. The "typical" and "aggressive gas collection" scenarios yield far greater collection efficiencies.

The Covanta and ERC letters also cite *Comparison of First-Order-Decay Modeled and Actual Field Measured Municipal Solid Waste Landfill Methane Data* (Amini, Reinhard, and Niskanen, 2013, Waste Management Vol. 33). This study found that the first-order-decay (FOD) model used to model landfill emissions can underestimate methane generation. However, FOD modeling for GHG emission calculations is frequently inaccurate, providing methane generation estimates that are both too high and too low, depending on the landfill. Furthermore, the landfills evaluated in the study are Danish, and results may not be representative of either the typical waste stream in the U.S. or landfill operations subject to U.S. regulatory requirements.

Available Collection Efficiency Data

The document entitled *Current MSW Industry Position and State-of-the-Practice on LFG Collection Efficiency, Methane Oxidation, and Carbon Sequestration in Landfills* (SWICS, 2009) was developed for EPA and reviewed seven studies of LFG collection efficiency. The analysis distinguished between study data from landfills with collection systems and cover practices compliant with the NSPS/EG rules, and data from landfills not meeting those regulatory standards. Not surprisingly, collection efficiencies were generally lower in non-compliant landfills than collection efficiencies at NSPS-compliant landfills. The SWICS study concluded that the most important factors affecting collection efficiency were cover type and extent of GCCS installation. These conclusions and an approach for estimating collection efficiency based on selected cover types and scope of GCCS installation was adopted with only minor modifications by the EPA for landfills reporting under the federal Mandatory Reporting Rule for GHG (GHGRP) (40 C.F.R. Part 98, Subpart HH).

A more recent study, *The Estimated 100-Year Collection Efficiency for U.S. Landfills* (Stege, A, Proceedings of 2013 SWANA Landfill Gas Conference), reviewed typical landfill operating practices throughout the U.S. The study compiled data from the EPA's Landfill Methane Outreach Program (LMOP) and grouped landfills by owner/operator -- large private, small private, public, and location – with those operating in the California South Coast Air Quality Management District (SCAQMD) and Bay Area Air Quality Management District (BAAQMD) separated due to their more stringent regulatory requirements. The study found that the 100-year LFG collection efficiency for typical landfills across the country was in excess of 80 percent.

In addition to the SWICS and Stege studies, the most recent direct measurement studies indicate that collection and control efficiencies are higher than the assumptions used in FOD models (De La Cruz et al., 2015 draft in final EPA review) (Walker et al., 2014) (Shan et al., 2013) (Green et al., 2012) (Goldsmith et al., 2012) (Chanton et al., 2011) (Green et al., 2009)). Direct measurement studies have also shown that inventory models used by regulators significantly over-estimate landfill methane emissions, as summarized below:

- (Shan et al., 2013) determined collection efficiencies of 91% to >99% based on statistically representative flux chamber measurements at four large California Landfills.

- (Walker et al., 2014) applied direct measurement of methane emissions and oxidation from (Goldsmith et al., 2012) for five California Landfills, four with Mediterranean climates and one with an arid desert climate. Control efficiency for the five landfills ranged from 83-88%. The effects of coverage of the landfill gas collection system and relative size of the working face and daily cover areas was analyzed and negligible.

- (De La Cuz et al., 2015) compared direct measurement of methane emissions from a humid landfill located in Southeastern U.S. with waste aged less than three years to modeled emissions and determined the FOD models predicted 4-17 times high emission rates than measured.

- Mønster et. al. (2015) showed that for 15 Danish landfills, model-predicted emissions were on an average, a factor of 5 greater than the measured emissions.

- (Green et al., 2012) compared direct measurement of four closed landfills without gas collection and found that the measured emissions were only 33%, 12%, 44%, and 17% of the emission rate predicted by the GHGRP (EPA MRR in table below). The corresponding over-prediction of models was by factors of 2.3 to 8.3 greater than the measured emissions. The SWICS methodology (SCS, 2009) which applies a 30% oxidation rate for soil mixtures likewise predicted much lower emission rates than the GHGRP:

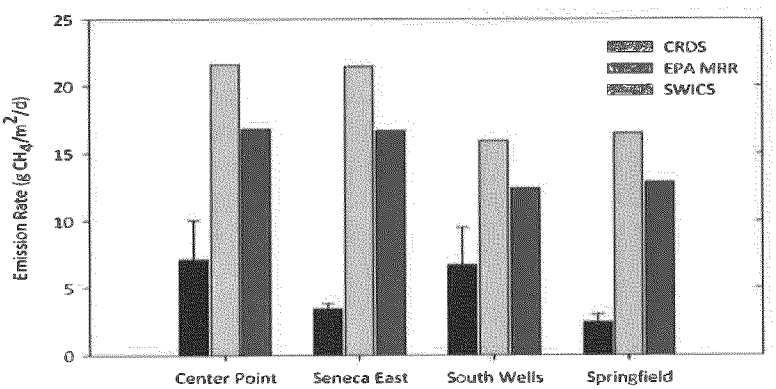

Figure 1. Comparison of Methane Emission Results from CRDS Measurements and Models (error bars represent 1sd)

- Two southern California Landfills were evaluated by research aircraft taking methane measurements in (Peischl, J. et al., 2013). Peischl et al. applied the measured emission rate to each site's footprint and methane collection and combustion data to estimate collection efficiencies of 73% and 77%. Applying an oxidation factor of 38 percent results in control efficiencies of 77% and 80%. These results are considered a lower bound by the researchers because of limitations in accounting for other sources of methane and potential atmospheric effects. Note that (Shan et al., 2013) estimated collection efficiencies at one of these landfills by two different methods of 93.1% and 95.9%.

- A study of three landfills (humid climate located in Southeastern U.S.) measured collection efficiency (ignoring oxidation) based on EPA Method OTM-10 of 73% (70/77), 80.5% (77/89), and 38% (Arcadis, 2012). Waste Management (Kelly et al., 2012) raised the following significant issues with the results from Landfill B (site with 38%):

- Bias toward high methane based on location with respect to an adjacent source (hog farm) and location downwind of LFG wells;

- The landfill installed a new gas collection system shortly after the measurements, so GCCS in place at time of study was not representative of modern landfills with systems operating in accordance with NSPS/EG; and

- There was only one measurement season (summer) as contrasted with the other two landfills, which were separately measured over two seasons.

The results of direct measurement studies refute docketed comments (EPA-HQ-OAR-2014- 0451 and EPA-HQ-OAR-2003-0215) that LFG collection efficiencies are much lower (about 35%-70% over the life of the landfill) than default values in inventory models used by regulatory agencies. Further, they refute comments that claim models of landfill gas emissions often result in significant under-estimation of emissions. There is neither a technical basis, nor direct measurement studies to underpin the claims that typical collection efficiencies are only 35-70%. Furthermore, methane oxidation was not incorporated into the study underpinning these comments, and should be for a more accurate assessment of landfill emissions.

Consistency with Recent EPA Regulations

As noted above, the EPA adopted a modified version of the SWICS methodology for calculating site-wide LFG collection efficiency at landfills under the GHGRP. That methodology uses a collection efficiency of 60 percent for area with daily cover, 75 percent for areas with intermediate cover, 95 percent for areas with final cover, and zero (0) for areas without gas collection. The collection efficiencies already adopted by EPA in federal regulation are significantly higher than the collection efficiencies of 20 and 35 percent advanced by the Sierra Club, Covanta, and ERC.

Direct Measurement

Finally, Covanta suggested in comments that direct measurement of landfill emissions should be incorporated as a requirement in the final standards. The comment letter notes several studies that have used remote sensing technology such as Vertical Radial Plume Mapping (VRPM) and Other Test Method 10 (OTM-10) to measure landfill area emissions.

While the industry agrees that significant fieldwork has been conducted using remote sensing technology, the Covanta comments minimize the challenges in broadly using these methodologies at landfills. For example, the Covanta-funded study, *Quantifying Methane Abatement Efficiency at Three Municipal Solid Waste Landfills* (EPA/600/R-11/033, January 2012) characterizes OTM-10 as a 'breakthrough in technology" that has "resulted in the ability to more accurately quantify" emissions, but fails to note that the technology requires extensive preparation and characterization of the topography and meteorology at subject landfills. Covanta also references the study to argue for assuming lower LFG collection efficiency rates, although the study does not provide sufficient support.

Waste Management (WM) provided comments to EPA's Office of Research & Development on the study in a letter dated September 28, 2012 (Kelly et al., 2012). The letter summarized key technical concerns including first, that the limited scope of the research, summarizing five measurement

campaigns at only three southeastern landfills, does not provide a sound basis for the document's broad policy conclusions and proposed next steps. Second, WM voiced significant scientific and technical concerns about the measurement methods and physical conditions at the sites, which call into question the validity of the reported measurements.

At EPA's request, WM in a letter to the Office of Air Quality, Planning and Standards, assessed the appropriateness of developing regulatory requirements for the use of the OTM-10 direct measurement technique (August 23, 2011). WM described key challenges in using the technique including that OTM 10 measurements can assess only 5 to 20 percent of the total landfill surface. This makes the technique subject to criticism regarding its spatial representativeness in determining emission rates. WM also described the difficulty in the set-up and use of the TDL equipment due to the complex topography associated with landfills and the strong influence weather (e.g., wind direction and speed, precipitation, barometric pressure) plays on the ability to obtain usable TDL readings. The large source size, heterogeneous source area, and interference from proximate or distant sources of emissions (from an adjacent landfill cell outside the measurement area or a wholly separate site) can create very significant uncertainties in measuring methane emissions at a landfill. Additionally, the process of direct measurement is expensive and may prove cost-prohibitive for widespread practical application.

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5. CalRecycle (2012) CalRecycle Review of Waste-to-Energy and Avoided Landfill Methane Emissions
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7. Amini, H.R., D. Reinhart, A. Niskanen (2013) Comparison Of First-Order-Decay Modeled And Actual Field Measured Municipal Solid Waste Landfill Methane Data, Waste Management 33.
8. California Air Resources Board (CARB 2009), Staff Report: Initial Statement of Reasons for the Proposed Regulation to Reduce Methane Emissions from Municipal Solid Waste Landfills, Appendix D: Evaluation of Landfill Gas Collection Efficiency, May 2009.
9. Alex Stege, Estimated 100-Year Collection Efficiency for U.S. Landfills.Proceedings 2013 SWANA LFG Symposium
10. Shan, J., Iacoboni, M., and Ferrante, R. (2013); "Greenhouse Gas Emissions from three Southern California Landfill Sites", Solid Waste Association of North America (SWANA) 36th Annual Landfill Gas Symposium, Las Vegas, NV.
11. Walker, S.D., Green, R.B., and Sullivan, P.S. (June 2014); California Landfill Methane Control Efficiency Based on Recent Direct Measurement Studies; Global Waste Symposium 2014, Orlando, Florida

12. De La Cruz, F., Green, R., Hater, G., Chanton, J., Thoma, E., Harvey, T., Barlaz, M. (in final EPA review, 2015); Landfill Methane Emissions: A Comparison of Field Measurement to Gas Production Models.
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15. Peischl, J. et al. (2013); Quantifying Sources of Methane Using Light Alkanes in the Los Angeles Basin, Journal of Geophysical Research: Atmospheres, Vol. 118, 4974-4990.
16. ARCADIS U.S., Inc. (January 2012); Final Report- EPA/600/R-11/033, Quantifying Methane Abatement Efficiency at Three Municipal Solid Waste Landfills, Prepared for: Susan A. Thorneloe U.S. Environmental Protection Agency Triangle Park, NC 27711, Office of Research and Development National Risk Management Research Laboratory, Air Pollution Prevention and Control Division Research.
17. Kelly, K., and Van Kolken Banister, A. (2012); September 28, 2012 comment letter to Richard Shores, U.S. Environmental Protection Agency on "Quantifying Methane Abatement Efficiency at Three MSW Landfills, EPA/600/R-11/033.

Shorter Lag Times for Wet Landfills Are Not Warranted or Justified

We are concerned that EPA is continuing to target "wet" landfills for additional requirements under the proposed NSPS/EG. In our comments on the ANPRM in 2014, we explained why EPA should not reduce the initial lag times for GCCS installation at landfills located in wet climates, landfills that recirculate leachate, or landfills that add other liquids to accelerate waste decomposition. We highlighted ambiguity in the definition of wet landfills, the oversimplification that results from definitions that rely primarily on measured precipitation and leachate levels, and the potential overlap in requirements between the Landfill NSPS/EG and the Subpart AAAA NESHAP.

We believe EPA's proposed definition of wet landfills focuses to narrowly on precipitation and leachate variables, and fails to consider the many other factors that influence moisture content in landfills. Our comments noted that precipitation is not well correlated with landfill moisture levels. Other factors, like waste acceptance rates, the amount of moisture in the disposed waste, cell size, cover type, and cover timing also have a significant impact on landfill moisture levels. We strongly urge EPA to avoid simplistic definitions that fail to account for the complexity of the landfill environment. EPA should not define landfills as "wet" based only on precipitation of over 40 inches per year. EPA should base its approach on sound science and analysis.

Recent research efforts conducted by EPA, in cooperation with solid waste industry and academic researchers (De la Cruz, F.B., Green, R., Hater, G., Chanton, J., Thoma, E., Harvey, T., and Barlaz, M., *Comparison of Field Measurements to Methane Emissions Models at a New Landfill*) at a landfill located in a wet climate (Southeastern U.S.) indicate that FOD models over-predict emissions from waste that is less than four years old by at least a factor of four. The study, to be submitted to the *Journal of Environmental Science and Technology*, compared field measurements (tracer correlation and eddy covariance) to FOD models using a k value of roughly 0.05. The study authors concluded

that additional field data on methane production and emissions is necessary to establish a path forward to updating the model parameters and methodology for estimating emissions.

We are also concerned that EPA has failed to provide any discussion of the cost and cost effectiveness of shorter lag time requirements. From our review of other proposed changes to the NSPS and EG, we have concluded that the more stringent requirements come with significantly higher costs. EPA should not finalize shorter lag times at wet landfills without providing additional information to the regulated community and other stakeholders.

Issues Associated with Applicability and Effectiveness Dates, and Implementation Issues

EPA has proposed to change the applicability date from 5/30/1991 to 7/14/2014 for new or modified sources. With this approach, very few sites will be initially subject to the proposed NSPS (Subpart XXX) and majority of sites will be subject to the proposed EG rule (Subpart Cf).

EPA has not followed a consistent approach historically in regards to updating NSPS rules. In some cases, EPA has updated the existing NSPS rule and retained existing applicability dates (40 C.F.R. 60 Subpart Eb[1], 40 C.F.R. 60 Subpart F). In other cases, EPA has retained the existing NSPS and applicability date (40 C.F.R. Subpart G: August 17, 1971 – October 14, 2011) and created a new NSPS rule and applicability dates for affected sources (40 C.F.R. Subpart Ga: after October 2011). EPA has never created a new EG rule to replace an existing EG rule. Further, EPA has updated EG rules but has not changed the applicability date (40 C.F.R. 60 Subpart Cb[2]).

EPA has now aligned the rule requirements and rulemaking schedule for the NSPS and the EG so there is no substantive difference in requirements between the rules. If EPA were to retain the 1991 applicability date for NSPS sites, then the proposed EG (Subpart Cf), including the Closed Landfill subcategory, could be incorporated in the NSPS (Subpart XXX) and EPA could retain the existing EG, (Subpart Cc) for sites that did not open or modify (expand the landfill) since 1991. This approach would significantly reduce regulatory burden for state and local agencies (they would not be required to prepare state plans or revise existing state rules) and EPA would not be obligated to prepare, issue and implement a Federal Plan.

Effective Date of Final NSPS Rule and Compliance Dates

There is no issue with the effective date of the NSPS rule as long as EPA includes clear and reasonable compliance timelines for submitting new or revised reports. The proposed NSPS rule includes a 90-day compliance timeframe for submitting design capacity reports and NMOC emission rate reports, which is consistent with WWW. The rule continues to assume these are first time reports and does not address whether sites already subject to NSPS WWW requirements must re-submit reports.

<u>Design Capacity Reports</u>
Sites that commenced operation prior to date of the final NSPS XXX rule (and submitted design capacity reports per NSPS WWW/EG Cc requirements) should be exempt from re-submitting design capacity reports. The design capacity report is required only to determine whether a site is subject to

[1] FEDERAL REGISTER Vol. 71, No. 90 May 10, 2006 pp. 27324-27348
[2] Ibid

the NSPS/EG rule and Title V requirements. This report is not relevant for sites where NSPS/EG and Title V requirements have already been triggered by an exceedance of the design capacity exemption. Furthermore, preparing and submitting the report would add unnecessary burden to the sites and regulatory agencies.

NMOC Emission Rate Reports

Sites that installed GCCS under NSPS WWW/EG Cc requirements should be exempt from re-submitting the NMOC emission rate report. The emission rate report is required only to determine when the site must install a gas system to control NMOC emissions. This report is not relevant for landfills with existing NSPS/EG-required GCCSs and preparation and submittal would add unnecessary burden to the sites and regulatory agencies.

For sites that are currently subject to NSPS WWW but have not triggered NMOC threshold requiring GCCS installation, EPA should continue to require annual or 5-year periodic reports and allow sites to use valid test data for the reports. The rule should not require new Tier 2 or Tier 3 testing if the test data and supporting information is still valid. Sites should have the option to complete additional Tier 2 or Tier 3 testing. Allowing sources to use previous emissions test results to demonstrate compliance with the NMOC threshold, if revised, is consistent with federal rules (40 C.F.R. 60 Subpart Ec) FR Vol. 74, No. 192 October 6, 2009 pp. 51368-51418

GCCS Design Plans and Gas Treatment System Monitoring Plans

Sites that installed GCCS under NSPS WWW/EG Cc requirements should be exempt from re-submitting the GCCS Design Plan. The Design Plan is required only to present a conceptual design of the GCCS that was used as basis to install the existing GCCS; therefore this report is not relevant. Preparation and re-submittal would add unnecessary burden to the sites and regulatory agencies.

EPA offers two criteria for when an affected source must update and submit its design plan: 1) within 90 days of expanding operations to an area not previously covered by the design plan; and 2) prior to installing or expanding GCCS in a manner other than one described in a previously approved design plan. The criteria and timeframes appear reasonable; however, we again urge EPA to provide alternatives to agency approval of Design Plans given the vast number of plans that have received no formal agency approval, which results in compliance uncertainty. The existing rules already require WWW and EG sites to report expansions made to the GCCS on semi-annual basis and to update the as-built maps that reflect current GCCS operations.

Currently, there is no compliance timeframe proposed in NSPS Subpart XXX for submitting a gas treatment, system monitoring plan. As this is a new proposed requirement, we are concerned that the proposed rule offers no transitional compliance period for existing sites with LFGTE projects that trigger Subpart XXX applicability upon expansion or modification. We recommend EPA allow for at least 120 days to prepare a treatment system monitoring plan. We again do not recommend EPA require agency approval of the plans, as further described in previous comments and below.

New Monitoring and Recordkeeping Requirements

If EPA finalizes any changes to monitoring and/or recordkeeping requirements in the NSPS, sites that installed GCCS under WWW requirements will require lead time to install new equipment (where applicable), develop/implement new processes and train staff/third party contractors before the site can comply with the new requirements. It may not be possible for a site to comply immediately upon the publication date of the final NSPS rule nor should EPA expect a site to immediately comply where monitoring and/or recordkeeping requirements are revised. For example, changes to SEM

requirements should be implemented in the subsequent calendar quarter after which the rules are published. Assuming the NSPS rule is published in July 2016, a site would implement any new SEM and recordkeeping requirements during the fourth quarter.

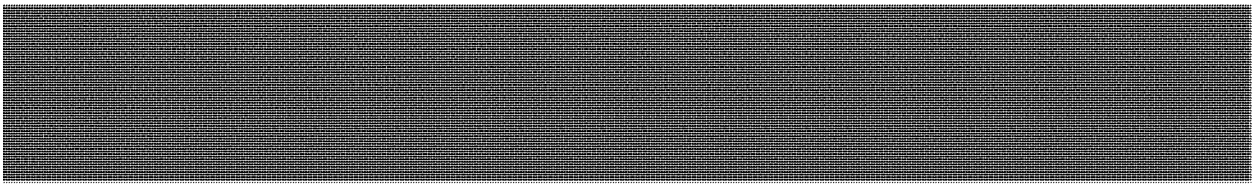
The undersigned organizations appreciate your consideration of these supplemental comments and hope the Agency finds them useful as you finalize the MSW Landfill NSPS and EG rules. Please feel free to reach out to us if you have any questions. We look forward to continuing to work with you as we prepare to implement the new rules.

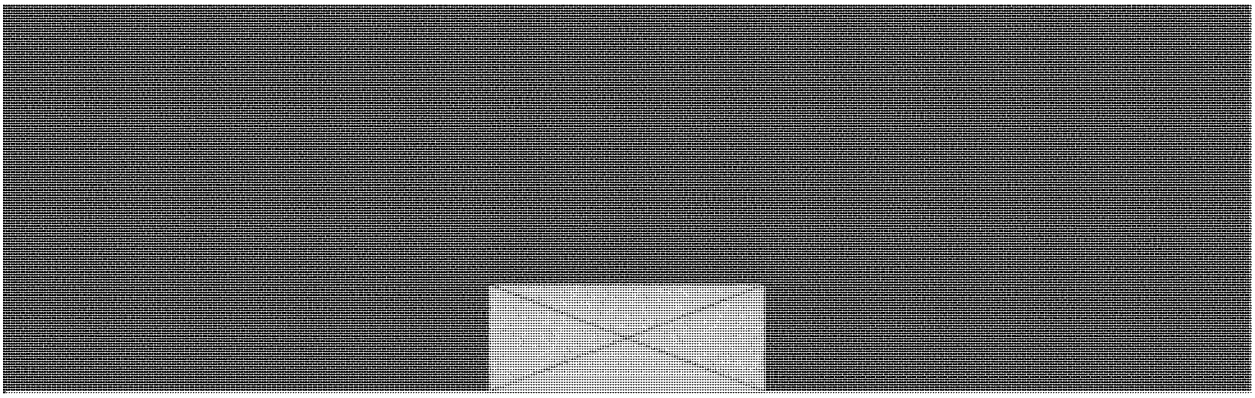
Sincerely,

Waste Management
Republic Services
Advanced Disposal
SCS Engineers
Weaver Consulting Group
Cornerstone Environmental Group
National Waste & Recycling Association
Solid Waste Association of North America
The Sanitation Districts of the County of Los Angeles

To: Dravis, Samantha[dravis.samantha@epa.gov]
From: ECOS
Sent: Fri 12/1/2017 8:48:55 PM
Subject: ECOS Launches Executive Director Search, Brownfields and Budget Bills Advance in Congress, & More

1. 2. 3. 4. 5.





To: Diamant, Adam[ADiamant@epri.com]
From: Diamant, Adam
Sent: Mon 11/13/2017 8:47:53 PM
Subject: Presentations from EPRI Fuels and Planning Seminar (Nov 8-9, 2017) (Part 2 of 2)
S7_Bistline_EPRI_FlexOps_2017 EPRI Seminar_110817.pdf
S8a_McMurry_Duke IRP_2017 EPRI Seminar_110817.pdf
S8b_Hedrick_SCE IRP_2017 EPRI Seminar_110817.pdf
S9_Jereza_DOE_Grid NOPR_2017 EPRI Seminar_110917.pdf
S10_Helm_PJM_Reliability Attributes_2017 EPRI Seminar_110917.pdf
S11_Bandera_MISO_2017 EPRI Seminar_110917.pdf

[Part 2 of 2]

Dear EPRI Seminar Speakers and Participants,

Thank you all for joining us last week for the **36th Annual EPRI Seminar on Fuels, Power Markets and Resource Planning**. We hope you enjoyed the seminar and found the presentations and discussion to be interesting and provocative.

Attached you'll find PDF copies of the speaker presentations. Because of the size of these presentations and the limitations on some of your email systems, I'm sending this out in two separate emails with half the presentations attached to each email.

If you have any questions or feedback about this year's seminar, please contact me.
Best regards,
Adam

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Manager, Market Analysis and Integrated Portfolio Planning (P178b)
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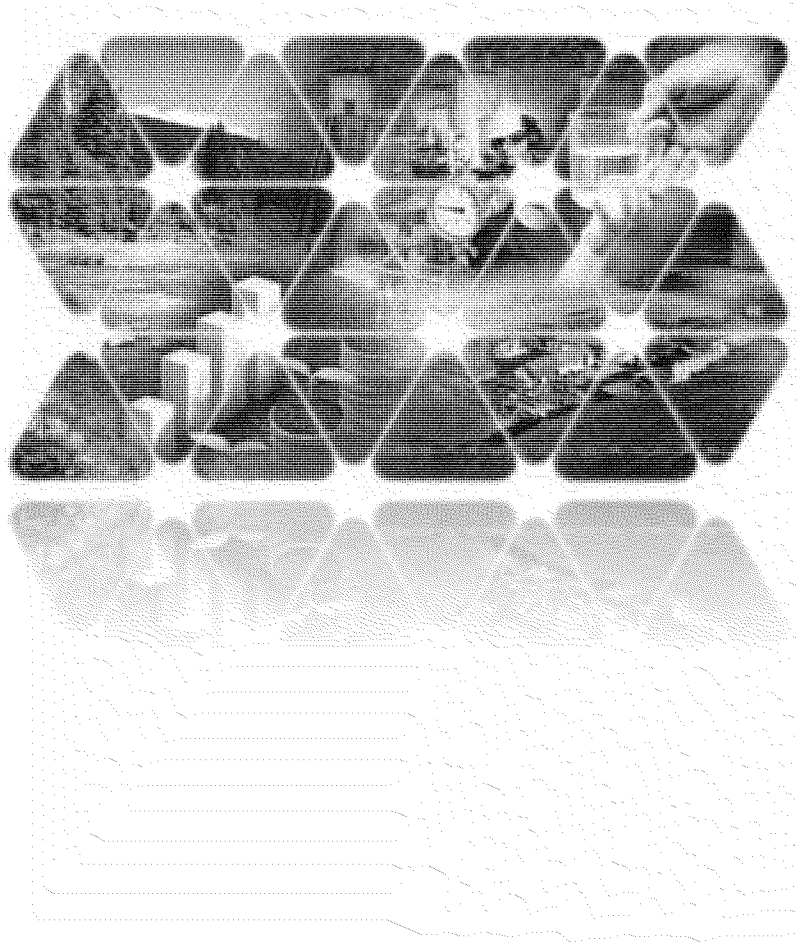
ELECTRIC POWER RESEARCH INSTITUTE

Economic Value of Fossil Fleet Operational Flexibility

Modeling and Insights in US-REGEN



John Bistline, Ph.D.
Senior Technical Leader

36th Annual Fuels Seminar – Washington, DC
November 8, 2017

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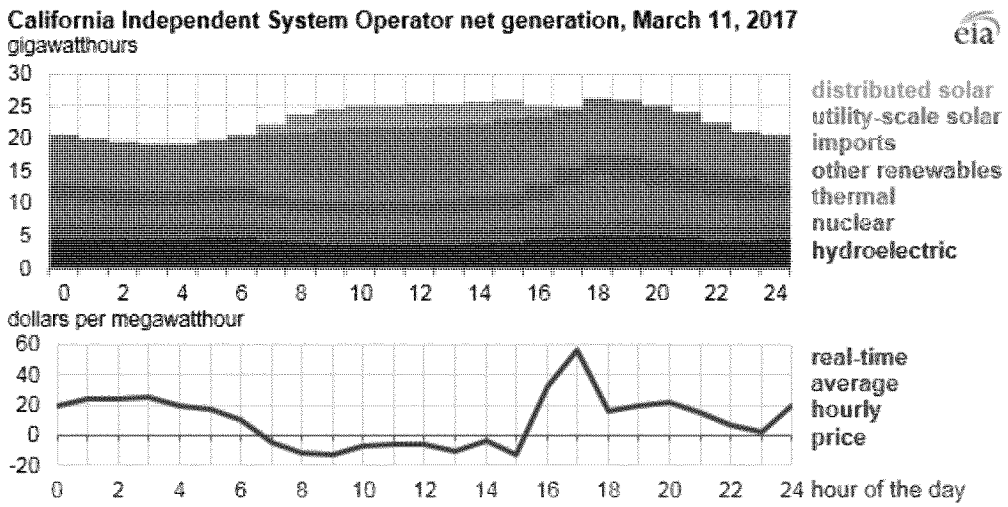
Motivations: Low Gas Prices, High Renewables, and Flexibility

- Value of dispatchable assets on the grid grows as the share of non-dispatchable resources increases
- Value prospects of minimum load operations for flexible generators
  - Avoid negative operating margins
  - Provide grid services (e.g., reserves)
  - Avoid frequent startups



This analysis focuses on the economics of individual asset flexibility instead of system flexibility

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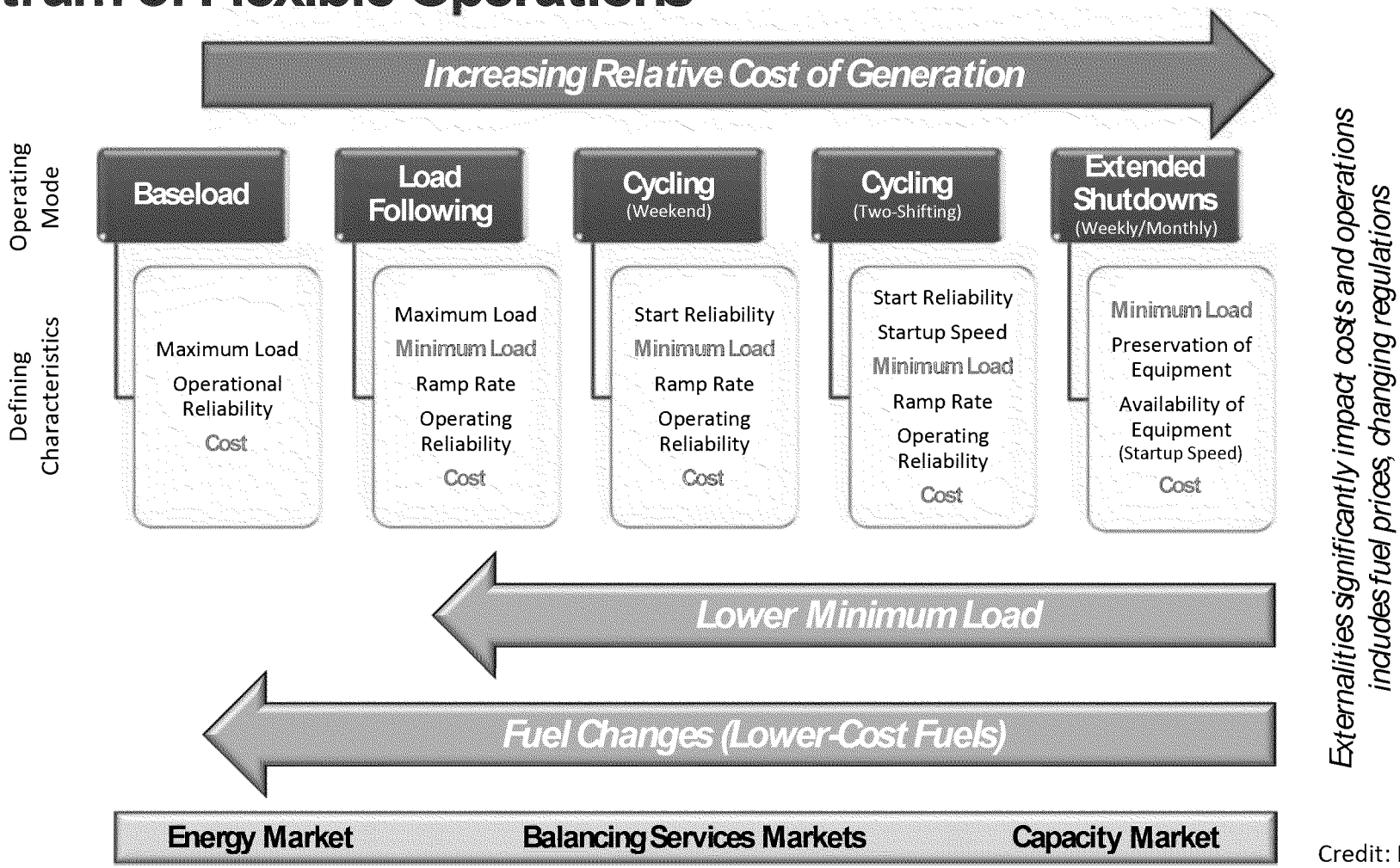
Spectrum of Flexible Operations



Externalities significantly impact costs and operations includes fuel prices, changing regulations

Credit: Mike Caravaggio

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Research Questions: Economics of Flexible Operations

- How can enhanced operational flexibility (in this analysis, **lower minimum loads**) for coal and gas assets impact operations and profitability under large-scale renewable deployment?
- How does the economic value of this flexibility vary across different regions, asset types, and market environments (e.g., level of renewable deployment)?

Goal is to evaluate the economic impact of improving technical parameters like minimum load to increase flexibility

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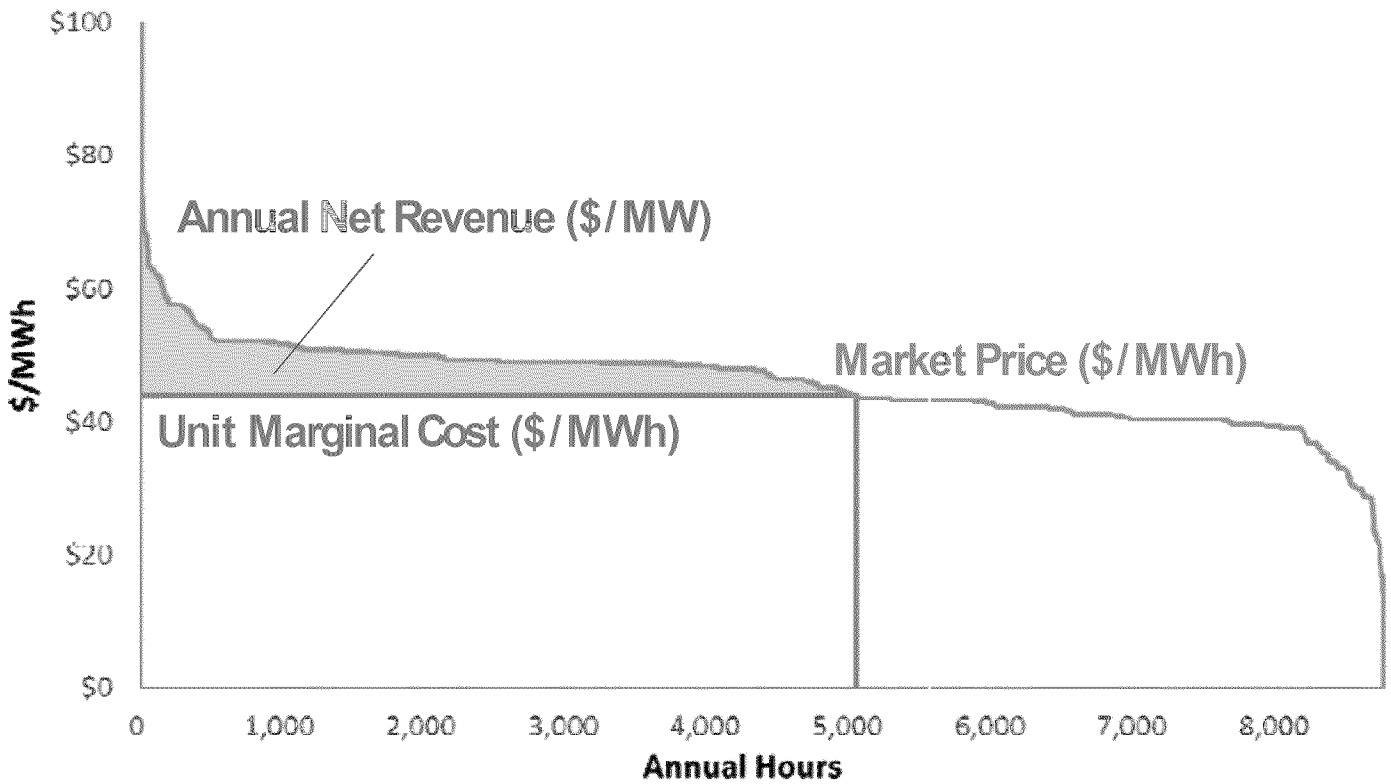
Price Duration Curves Drive Net Revenues for Power Plants

Example without Commitment Costs and Constraints



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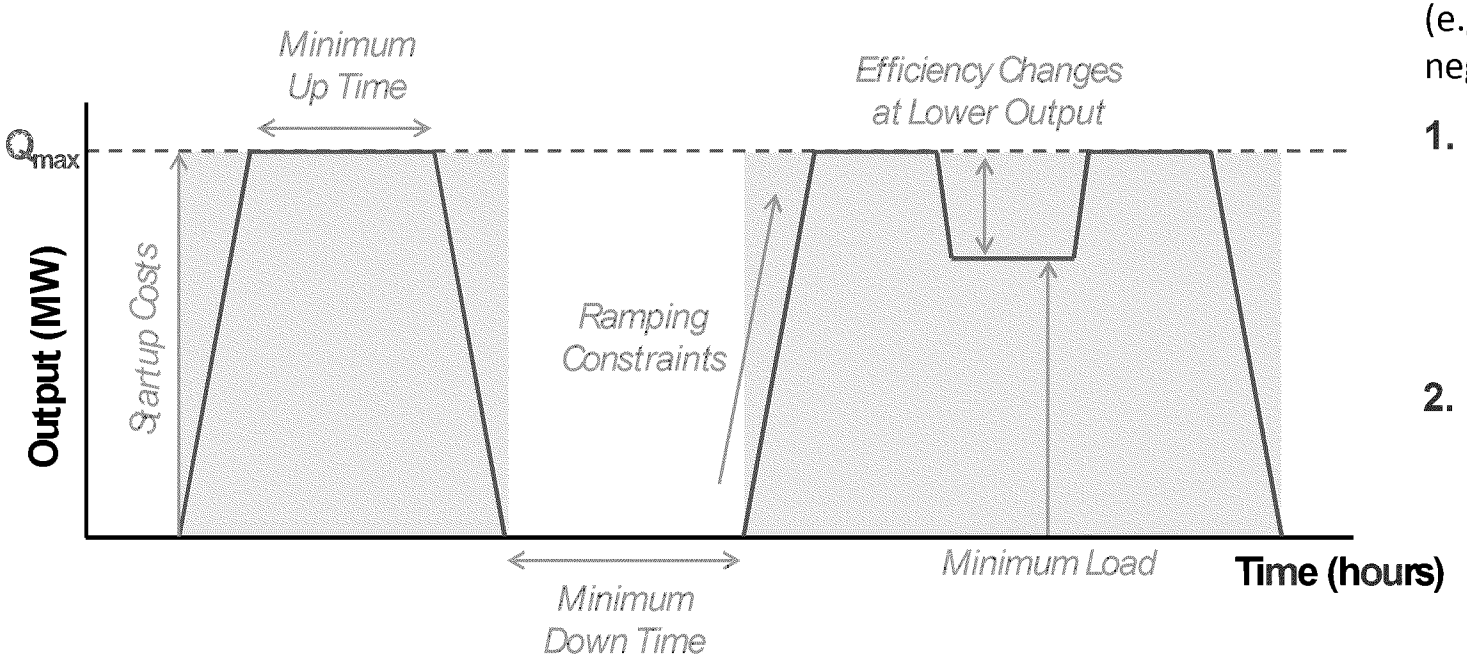
Impacts of Commitment Costs and Constraints



When operating margins for plants (e.g., spark spreads for gas units) turn negative, a plant can:

1. **Ramp down:** Stay online at minimum stable capacity, which forces the unit to absorb losses for generation but avoids shutdown and startup costs
2. **Shut down:** Turn off entirely, which avoids operating at a loss but with additional costs

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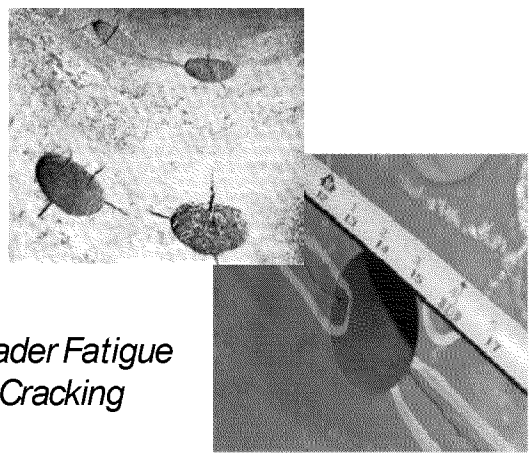
Turn Down for What? Physical Impacts of Flexible Operations

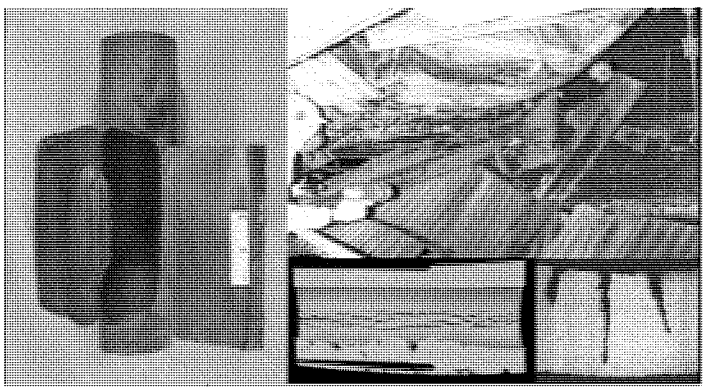
Thermal Fatigue Damage



Header Fatigue Cracking

- Predominate failure mode in boiler/turbine components subject to: frequent starts, fast ramping, etc.
- Caused by temperature mismatches between steam and metal surfaces

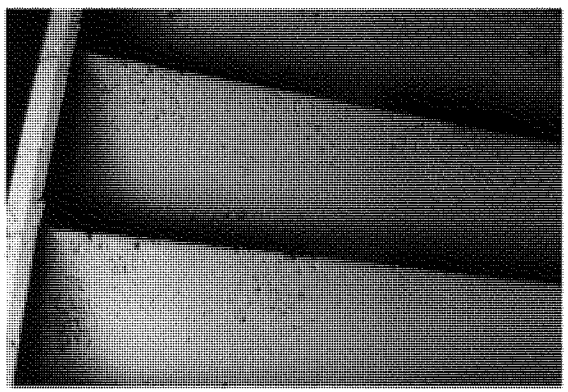
Corrosion Fatigue



Tube Failures

- On drum units, corrosion fatigue has been observed on riser tubes
- Involves combination of: manufacturing-induced bend stress, water chemistry fluctuations, etc.

Steam Turbine Impacts



Steam Chemistry: Offline Pitting

- Reliability areas impacted: differential growth, thermal and speed cycling, creep fatigue, steam chemistry effects, erosion and corrosion, low-load impacts on blade flutter

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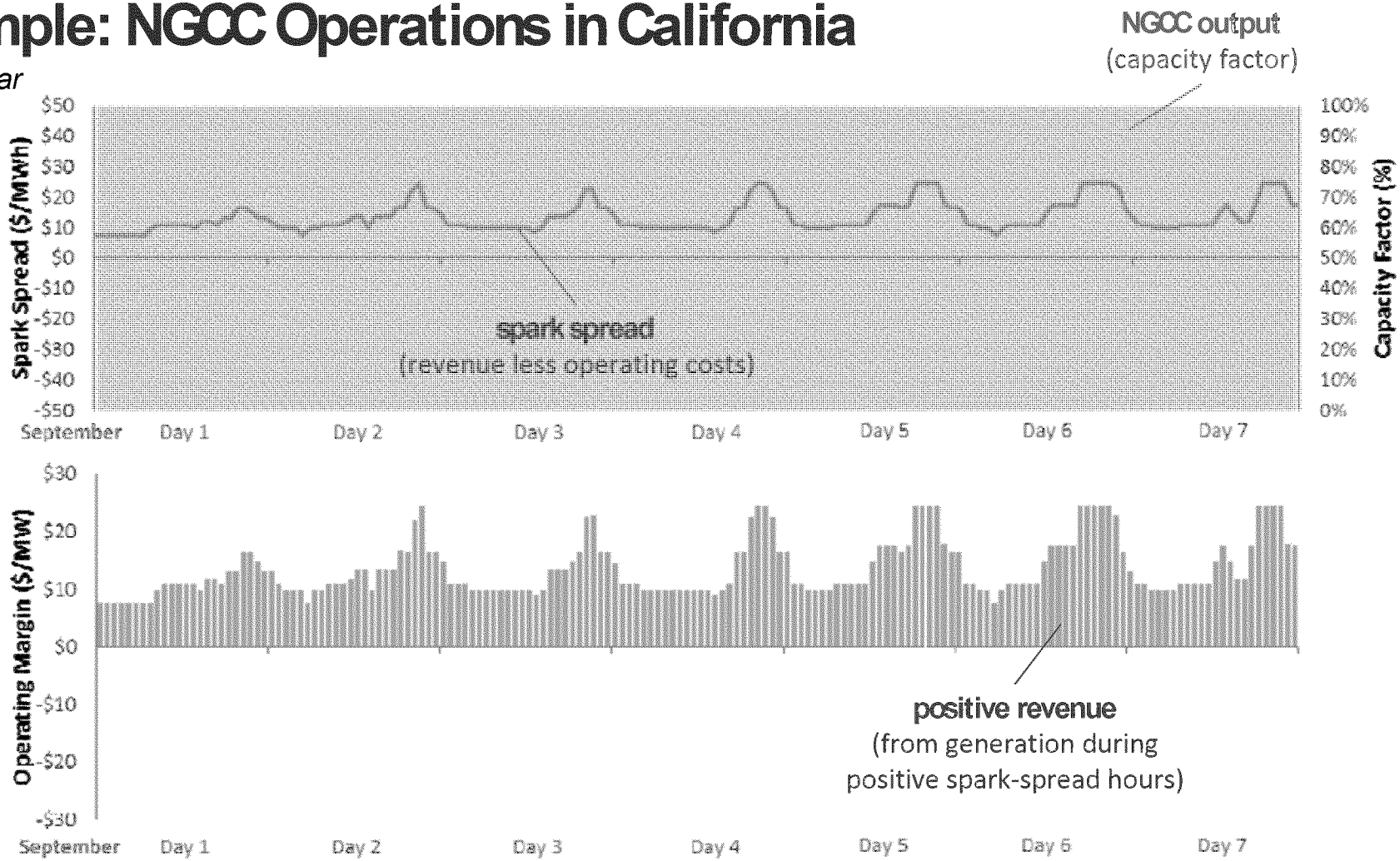
Example: NGCC Operations in California

0 GW Solar



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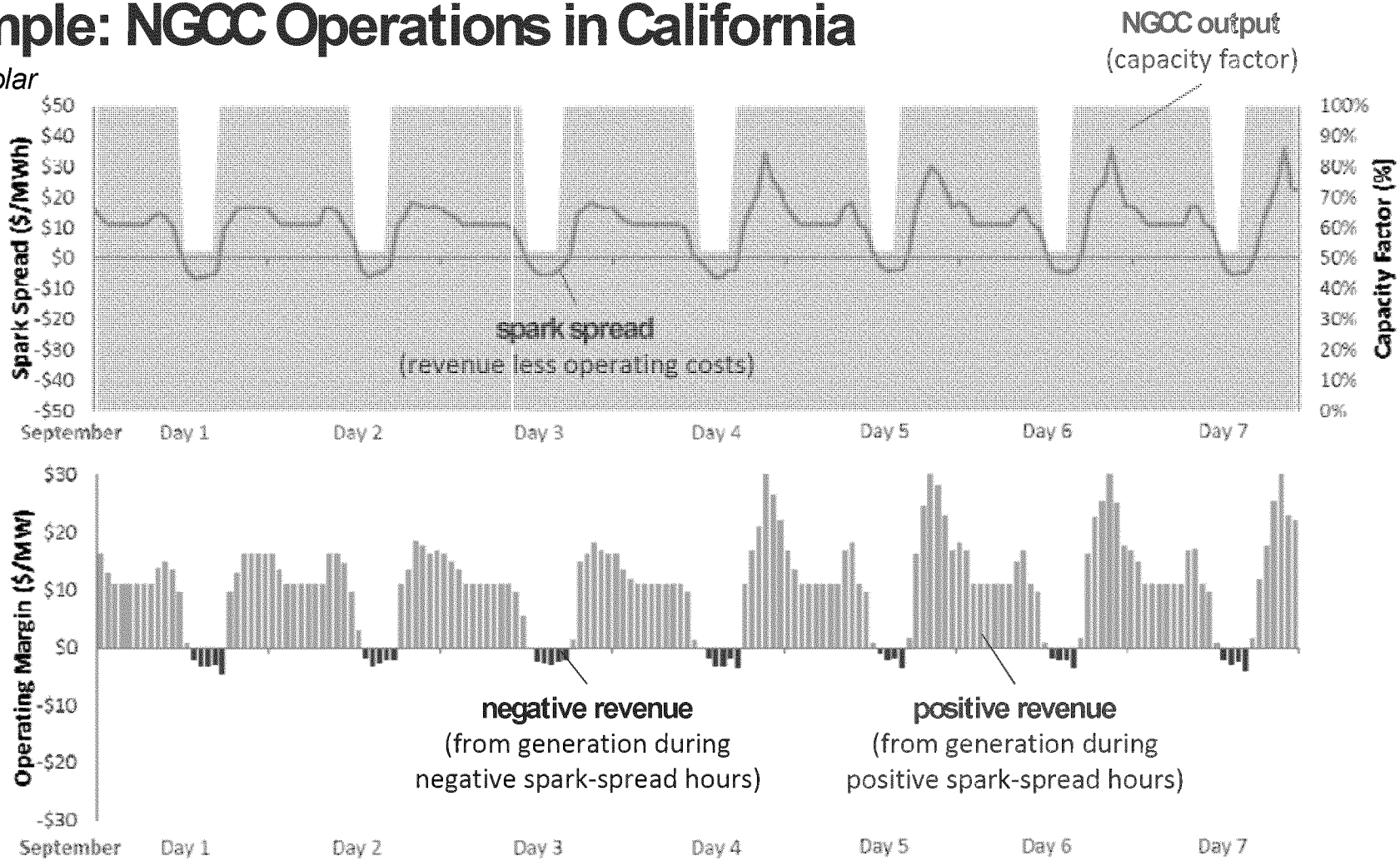
Example: NGCC Operations in California

40 GW Solar



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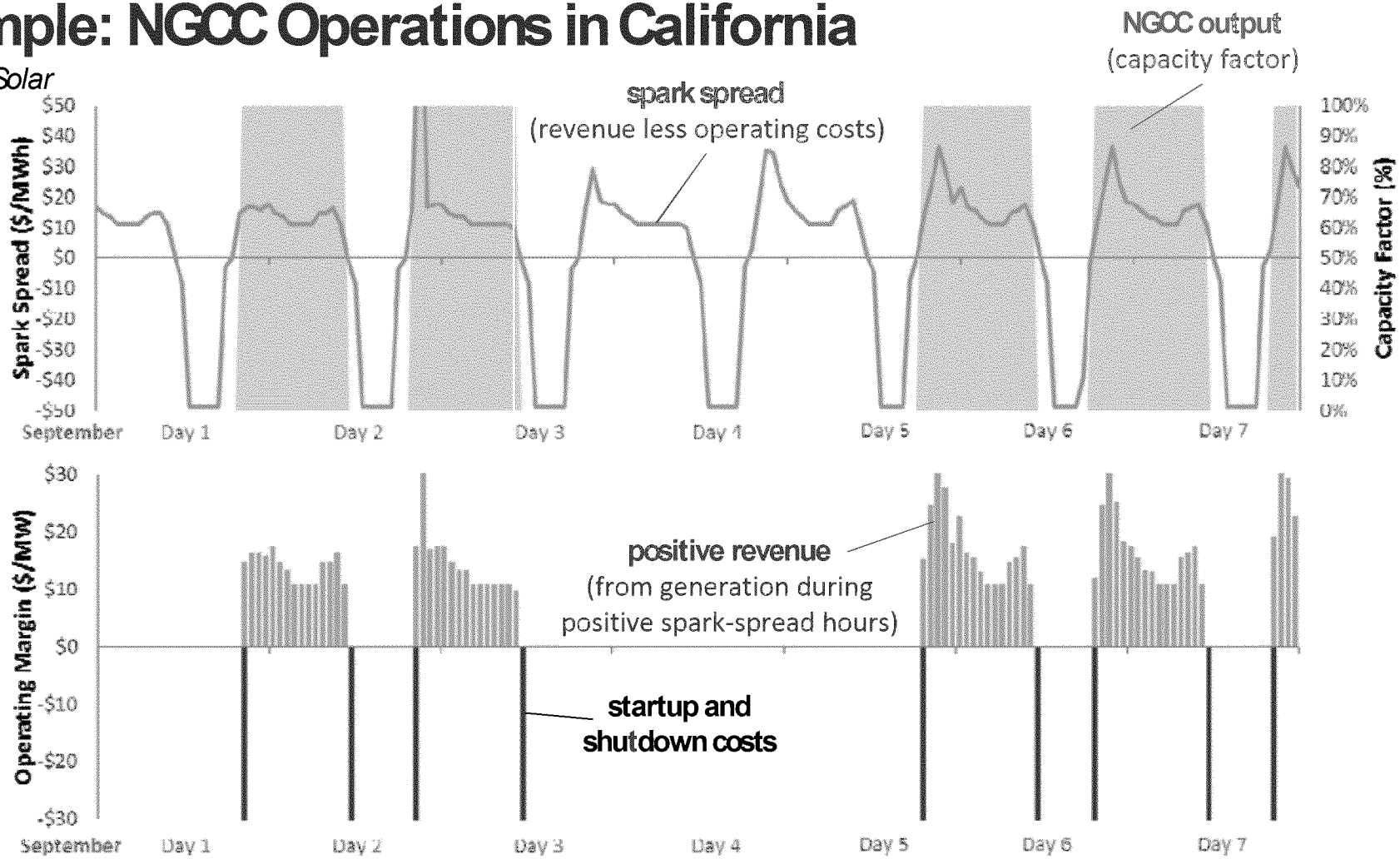
Example: NGCC Operations in California

100 GW Solar



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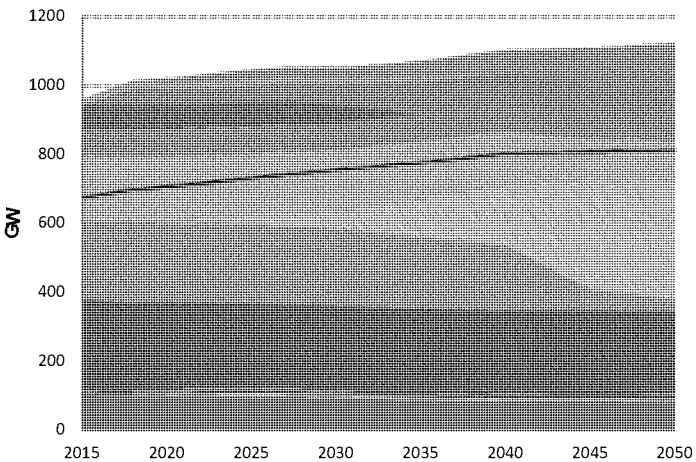
US-REGEN: EPRI's In-House Electric Sector Model

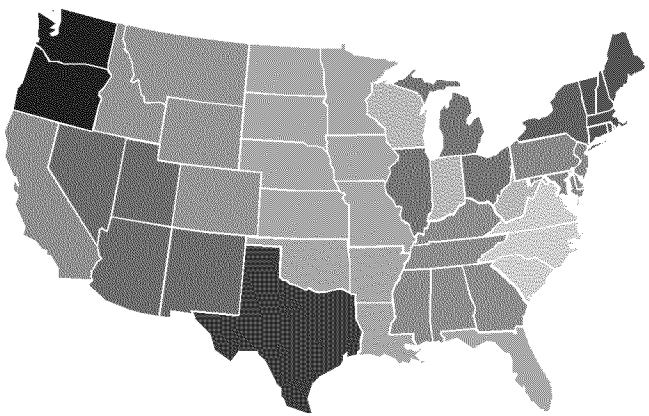
U.S. Regional Economy, GHG, and Energy

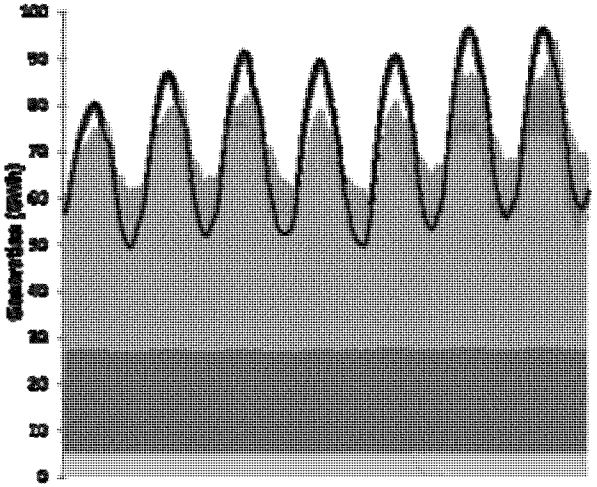
Capacity Expansion Economic Model, Long Horizon to 2050

Customizable State/Regional Resolution for Policy and Regulatory Analysis

Linked with Hourly Unit Commitment Model







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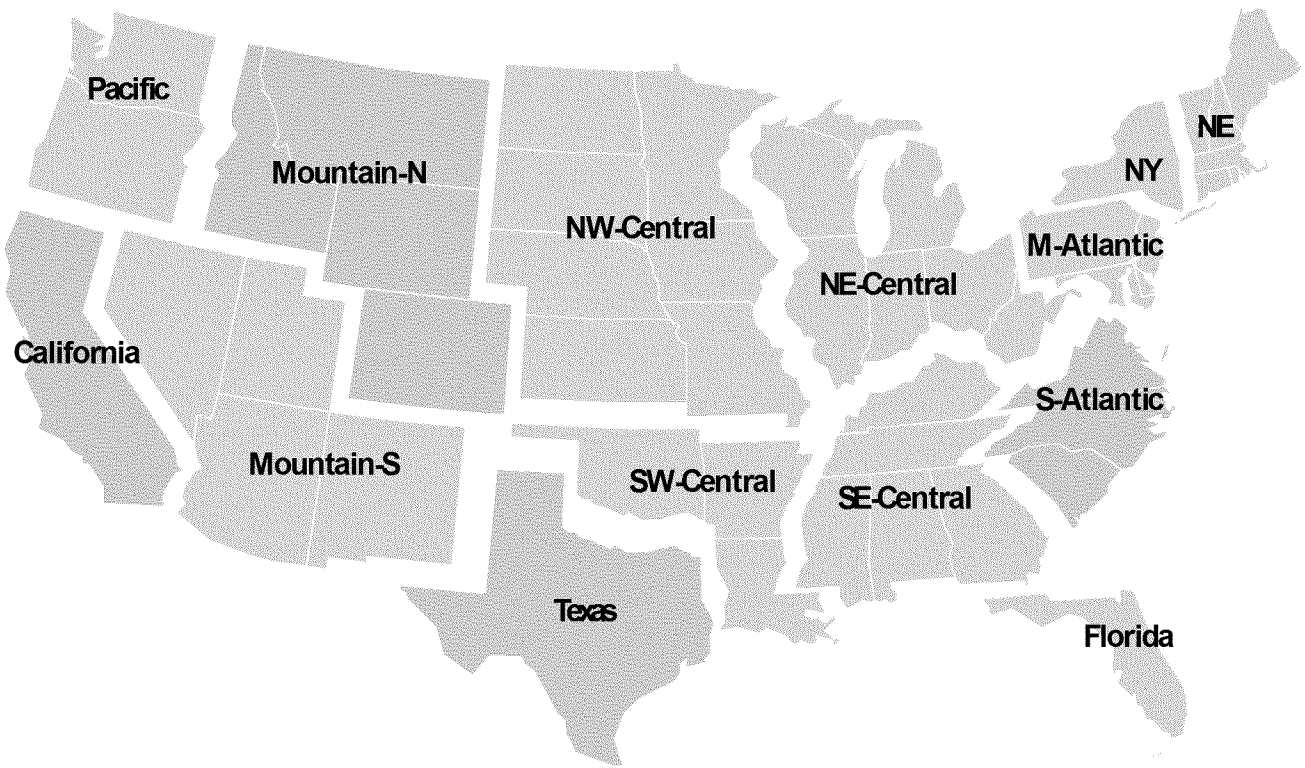
Scenario Description

- Focus on **four regions** in **2035**
- Five policy scenarios
  1. **Reference** (current policies only)
  2. **CO_2 tax** ($16/t-$CO_2$ in 2035)
  3. **Solar mandate** (50% in-region demand)
  4. **Wind mandate** (50% in-region demand)
  5. **50/50 solar/wind mandate** (50% in-region demand)
- **Three asset types:** coal and NGCC (existing and new)
- Two parametric sensitivities
  - Lower minimum load
  - Startup costs



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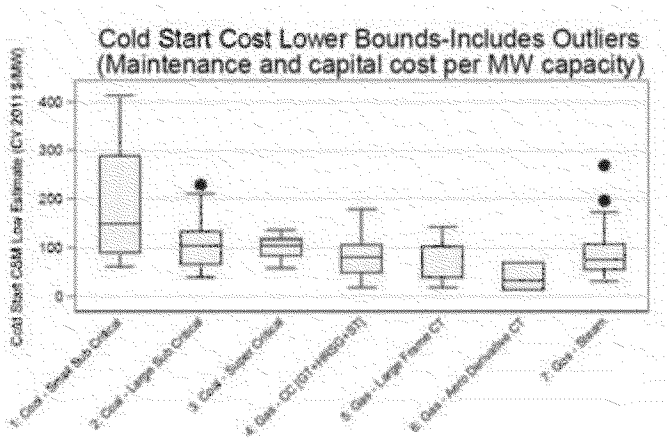
Model Parameters

Startup and Cycling Costs



- Using 25th and 75th percentiles for low/high values, but Intertek considers these "**lower bound costs**"
- By start type, technology, and cost category (O&M, fuel, and other)
- Source: NREL/Intertek (2012), "Power Plant Cycling Costs"

Minimum Load Levels

	Low	High
Coal	20%	50%
NGCC (New)	20%	50%
NGCC (Existing)	20%	50%

- Value of flexibility connected to initial ("High") and final ("Low") parameters for minimum load levels
- Using the same values enables apples-to-apples comparisons across asset types
- Sources: NREL/Intertek (2012), BNEF

Heat Rate

	Full (MMBtu/MWh)	Penalty (% increase)
Coal	9.2	15%
NGCC (New)	6.8	20%
NGCC (Existing)	8.2	20%

- Using representative assumptions for existing supercritical coal, new NGCC, and existing NGCC
- Sources: ABB Velocity, EPRI

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Detailed Regional Results

Enhanced Operational Flexibility and Cycling Impacts in Texas

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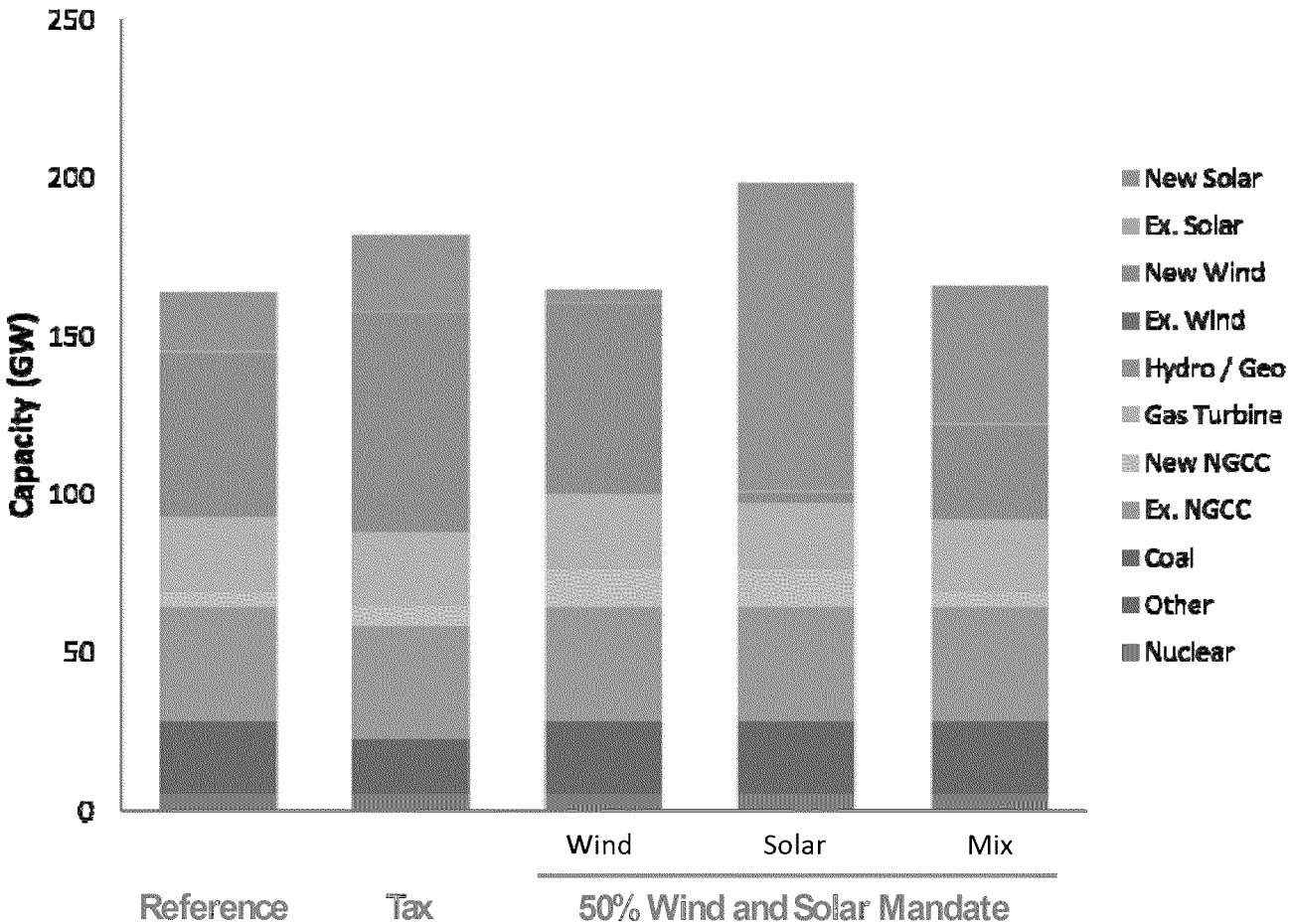
Scenario Assumptions Drive Investments: 2035 Capacity in Texas



Observations

- Wind development is extensive in the reference scenario
- CO_2 tax forces some coal retirements but more significant changes in dispatch
- Under 50% RPS, lower capacity needs when portfolio of renewable technologies included
- Caveat: Changes in other regions under these scenarios, which are not shown here

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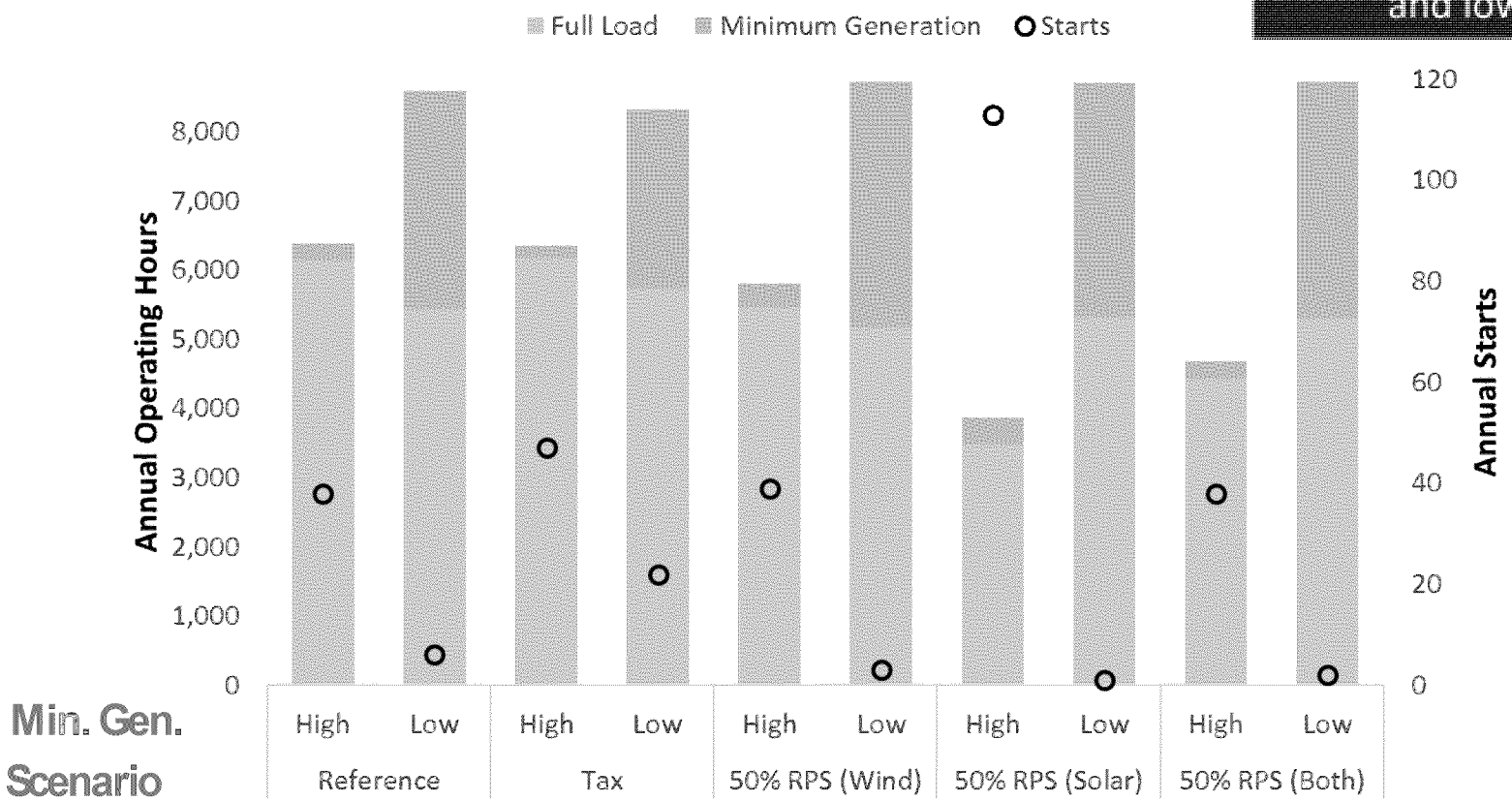
Changes in Operations with Lower Minimums

Texas, NGCC (New)

Higher capacity factors when NGCC units can avoid starts and lower losses



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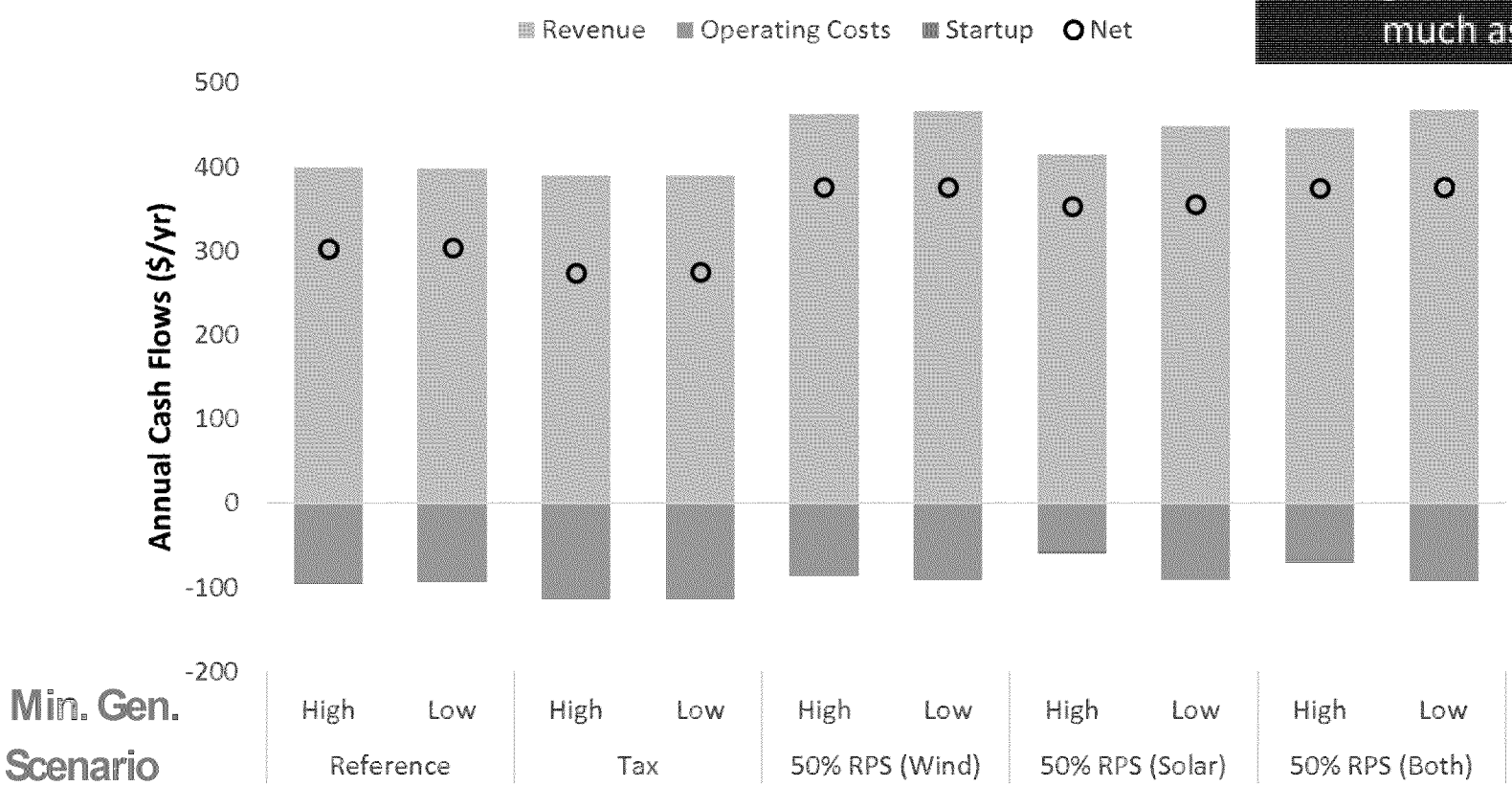
Changes in Operating Revenues with Lower Minimums

Texas, NGCC (New)

Total annual operating margins do not change as much as dispatch



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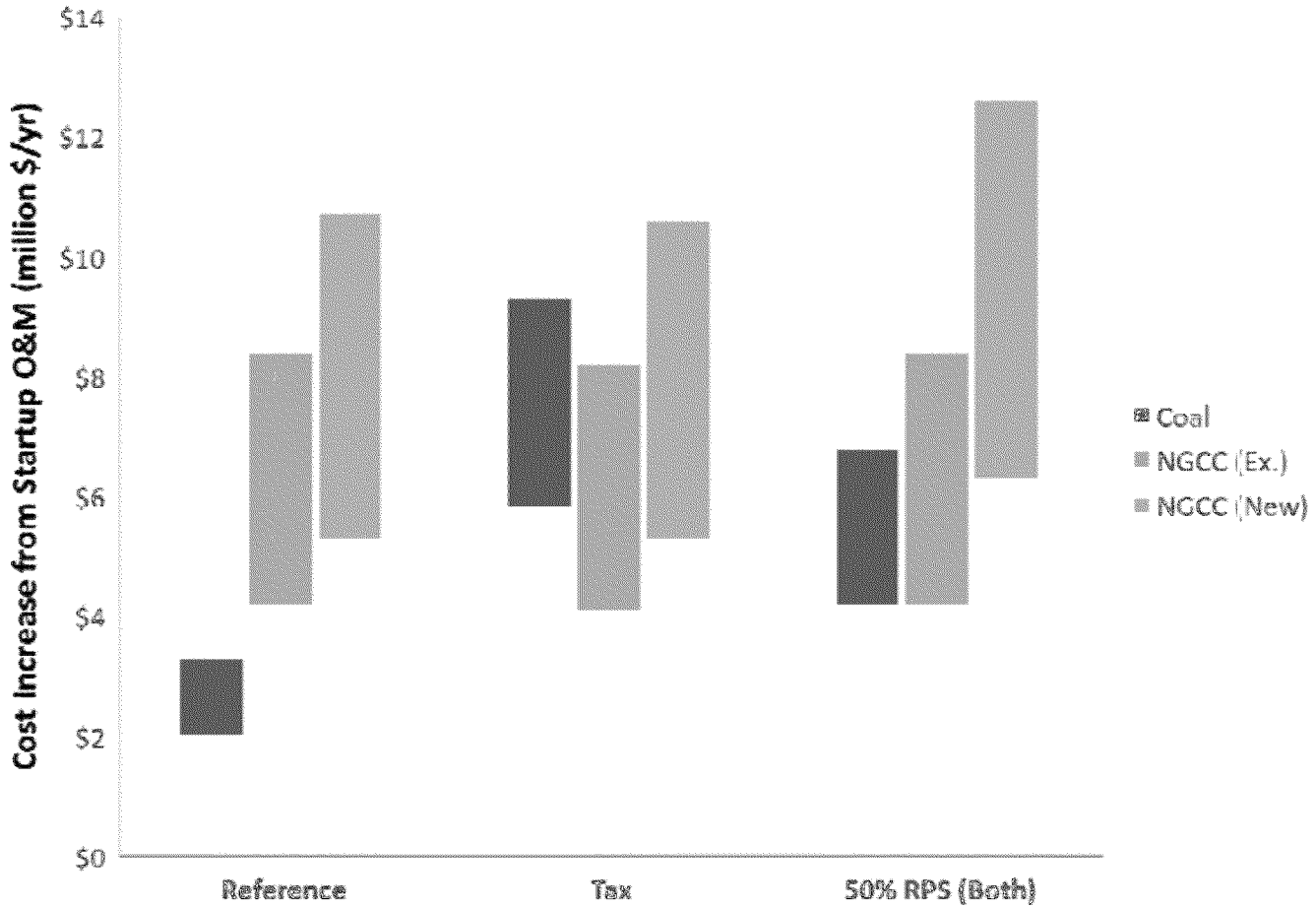
Long-Run Cost of Simple Dispatch

Texas



Notes

- Vertical axis = long-run O&M costs due to cycling if dispatch is based only on short-run marginal costs
  - Based on Intertek (2012)
  - Range shows 25th/75th %ile
- Costs track number of starts

Takeaways

- CO_2 tax scenarios increase cycling and costs for coal units
- Startups are lower for coal since in-the-money for many hours (opposite for existing NGCC)
- High renewable deployment drives greater system ramping/flexibility needs

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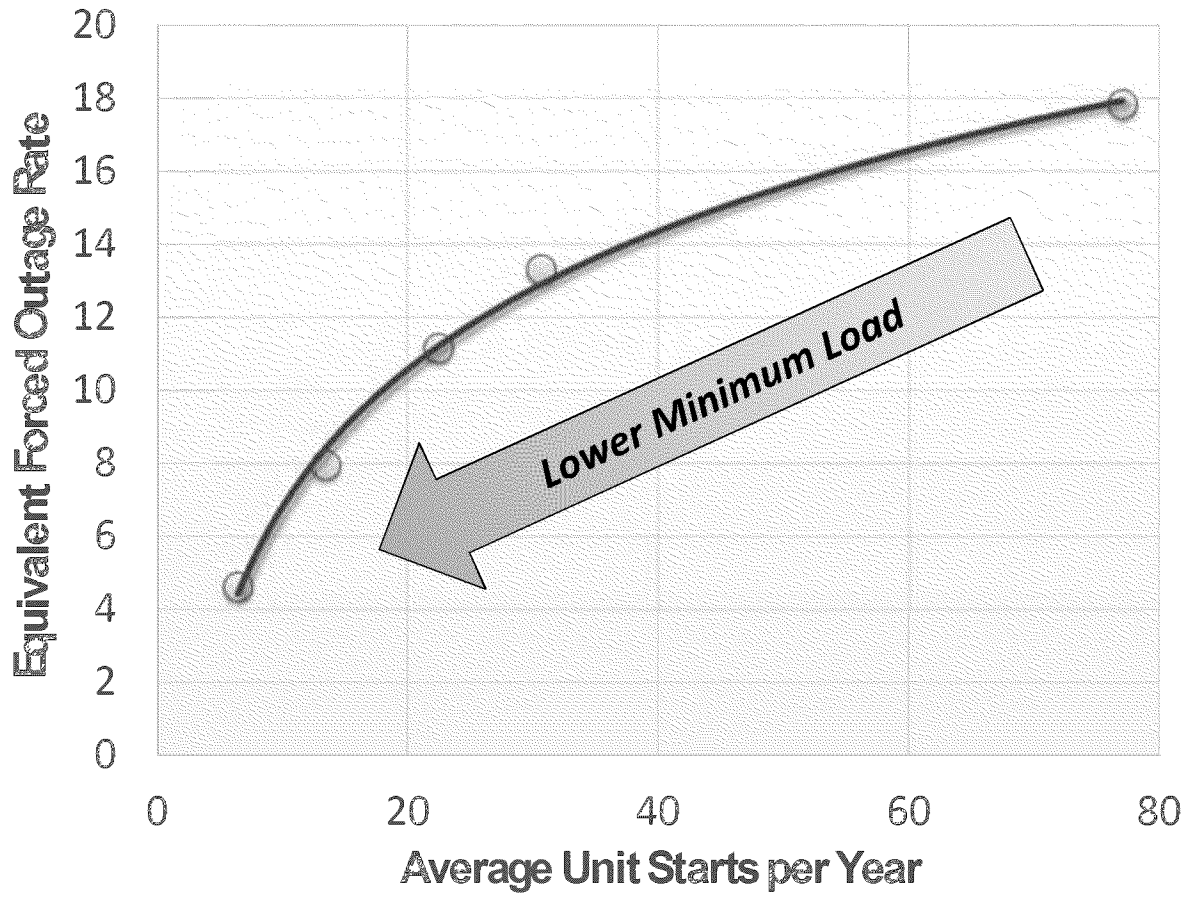
Caveats

- Not including full range of possible O&M costs
- Not including possibility of early retirement
- Not including changes in outage rates



Lowering minimum load reduces startups, which reduces EFOR

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Observations: Lower Minimum Loads in Texas

- Expected returns for coal- and gas-fired generators are shaped by future market and policy conditions
  - Operational characteristics are a second-order driver of profitability
  - Flexibility allows assets to adapt to bearish markets
- Plant flexibility impacts operations more than annual margins
  - Especially true for mid-merit units
  - Could impact long-run closures if cycling O&M is more costly than currently anticipated, especially since damage mechanisms give rise to "lumpy" costs
- Preparations for flexible operations can help regardless of which state-of-the-world obtains

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Cross-Regional Comparison

How well do insights about flexible operations transfer to other regions?

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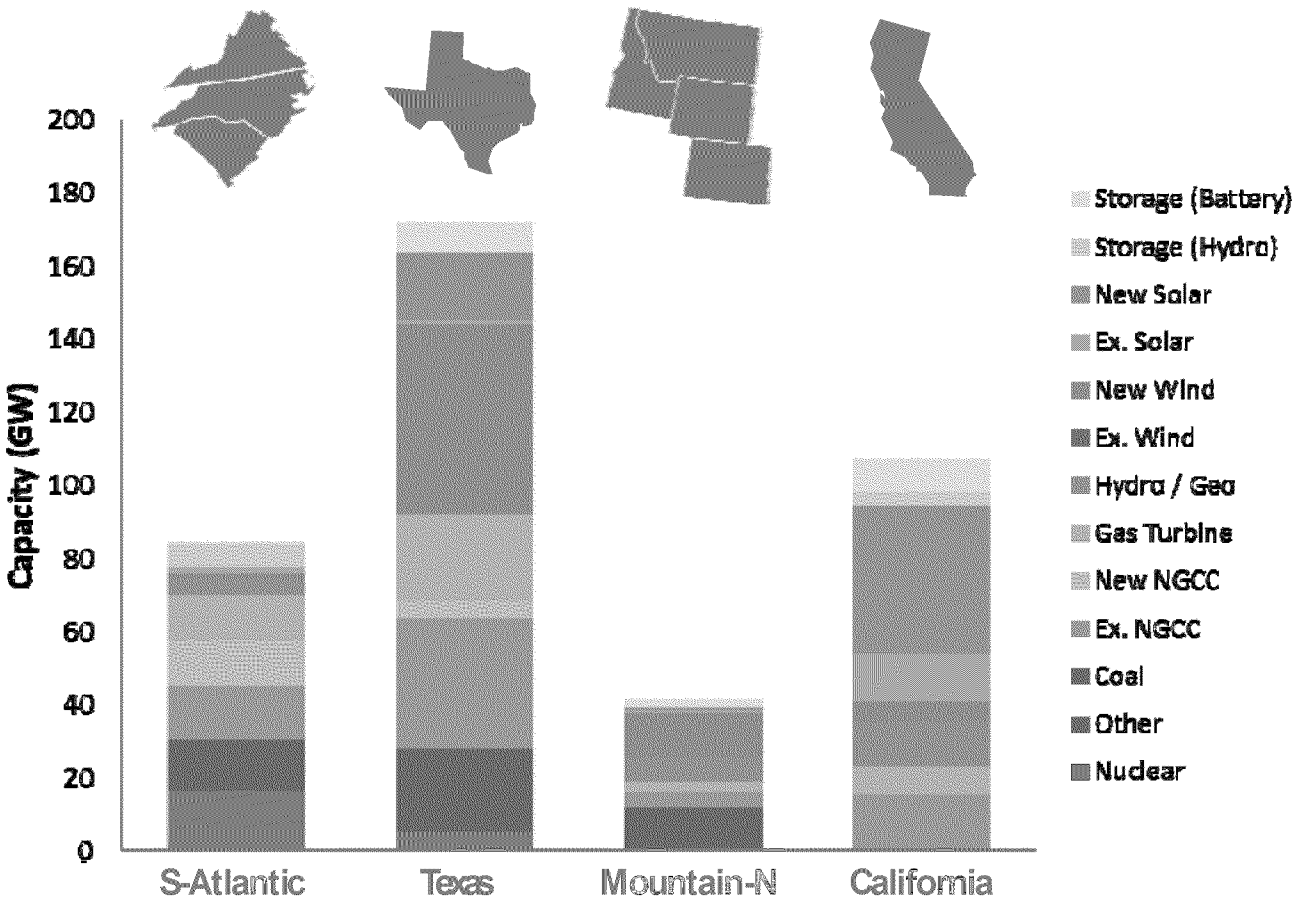
Capacity and Minimum Generation Levels Vary across Regions

Reference Scenario in 2035



Observations

- Grid sizes and compositions vary significantly without policy
- Economics of wind are strong in Texas and Mountain-N even without policy support
- S-Atlantic has more inflexible generation (in absolute and relative terms) than other regions

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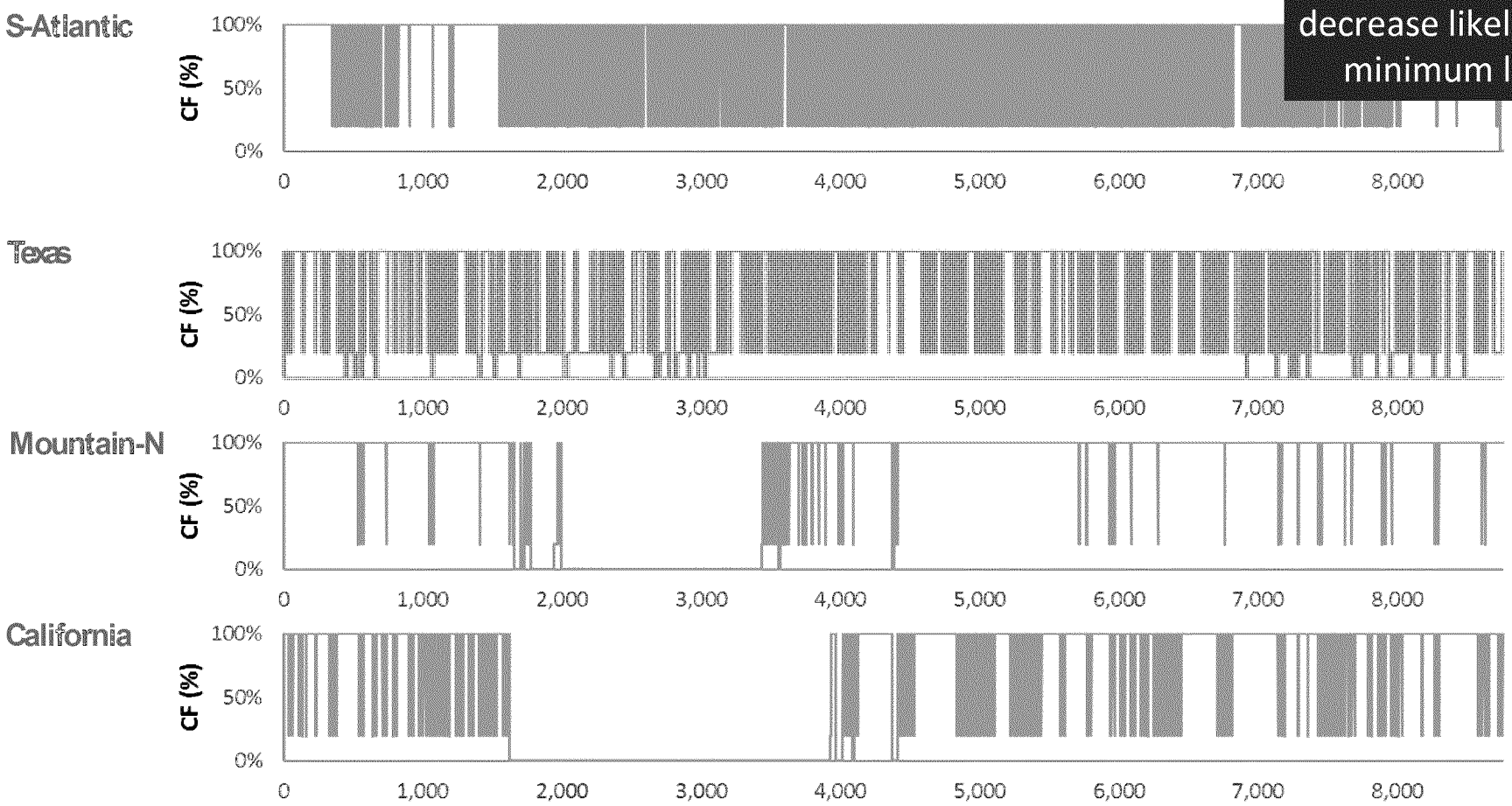
Hourly Dispatch of New NGCC Unit under Reference Conditions

Extended shutdowns decrease likelihood that lower minimum loads will help



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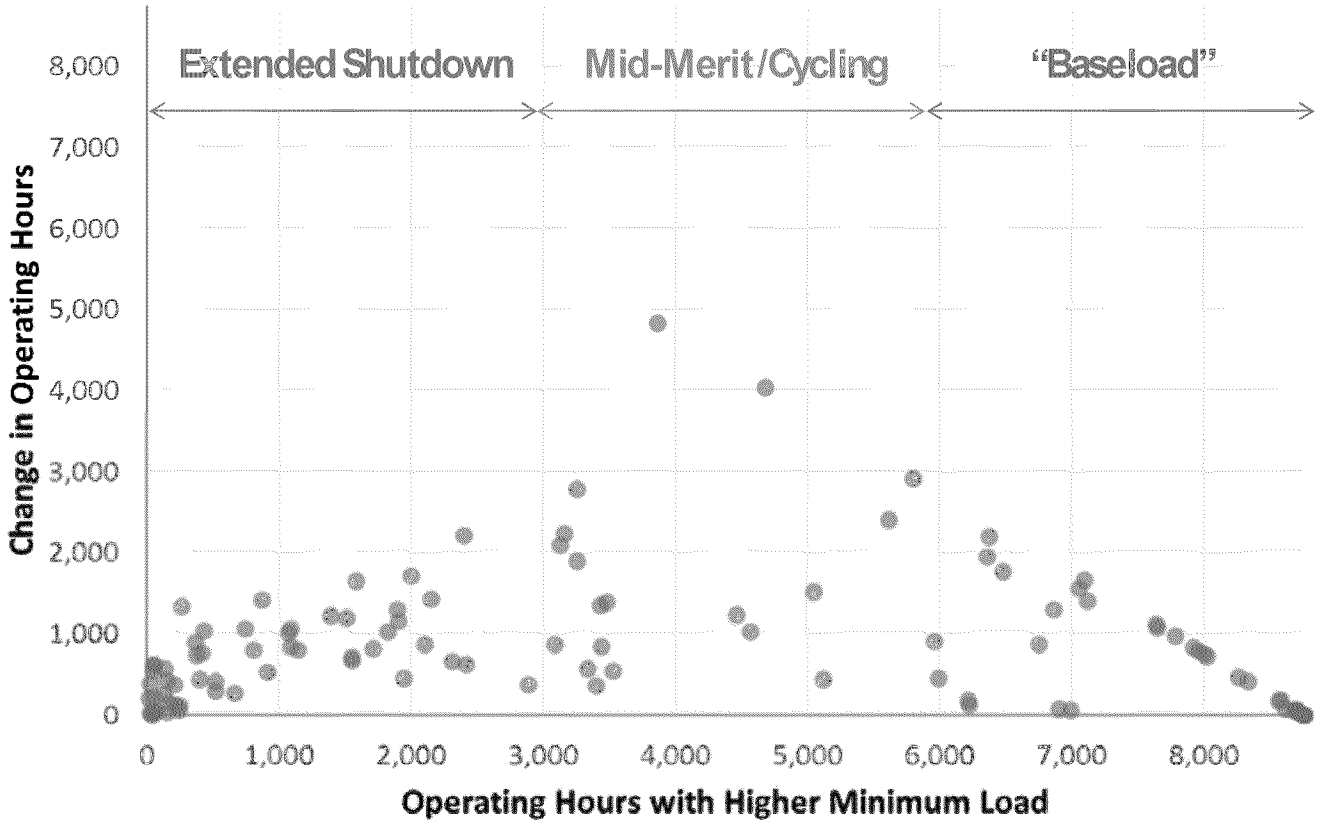
Changes in Operating Hours with Lower Minimum Load

All Regions, Scenarios, and Asset Classes



Mid-merit units benefit most from lower minimum loads

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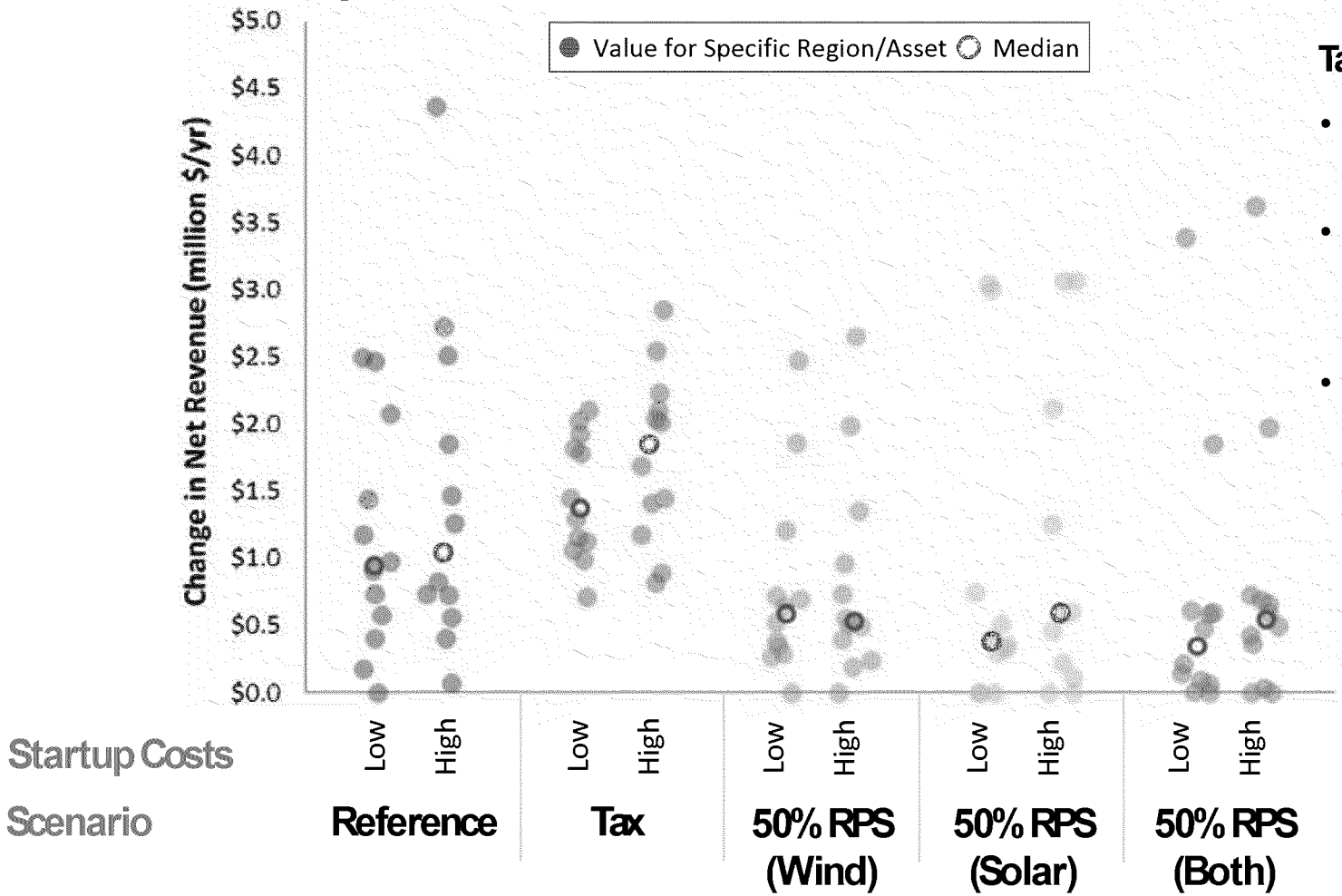
Profitability Increases with Lower Minimum Loads



Takeaways

- Flexibility can be valuable even without significant VRE buildout
- Lower minimum generation is most valuable (on average) under a CO_2 tax (e.g., coal as mid-merit)
- Under 50% RPS scenarios, net profitability impacts are similar, even though system costs vary
  - Seasonal/diurnal patterns differ, but offsetting effects
  - RPS often induces seasonal layups, which lower the value of flexibility

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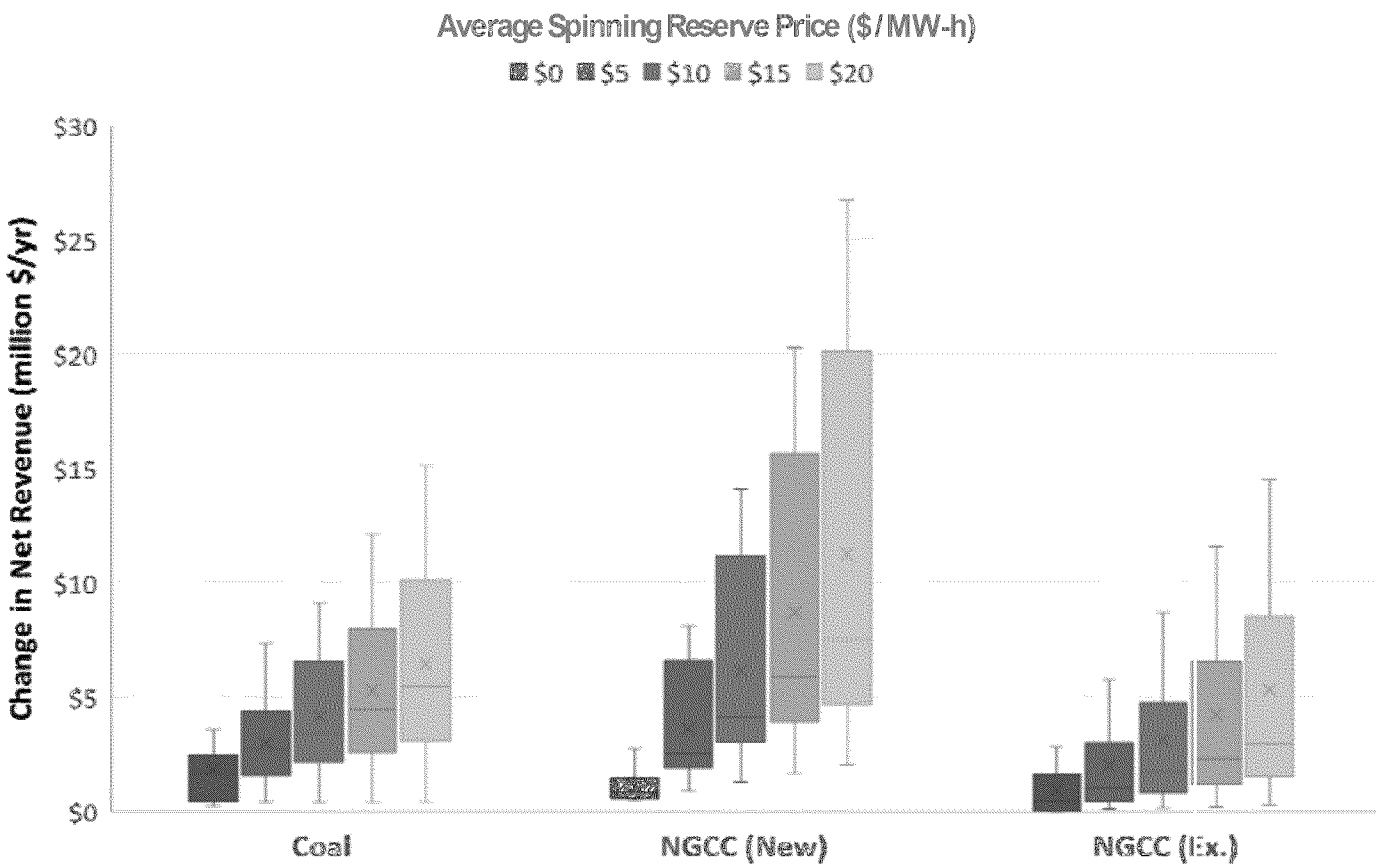
How Valuable Are Lower MinGen Levels with Reserve Revenues?



Takeaways

- NGCC benefits most from reserve revenues due to higher number of hours at minimum generation (i.e., with capacity headroom)
- Ancillary services revenues can boost economics of flex. ops., but markets are uncertain and "thin"
- System forecast errors become more important to track over time
  - Impact reserve needs/prices
  - Essential also for determining least-cost commitment schedule, especially if starts are costly

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Takeaways

- Flexibility (e.g., through lower minimum loads) lowers costs
  - Profitability impacts accrue in the long term, even though the most significant operational impacts are related to short-run dispatch
  - Difficulty: Long-run cycling costs are uncertain!
- Lower minimums are most valuable when…
  - Policies rearrange merit order (e.g., CO_2 tax)
  - Mid-merit units (e.g., new NGCC) are considered
  - Regions/scenarios do not force seasonal layup
  - Units are more flexible than other comparable generators
- Discrepancy between system value of flexibility and incentives for generators to provide?
- Ancillary services revenues improve prospects for flexible operations, but their market outlook and depth are unknown

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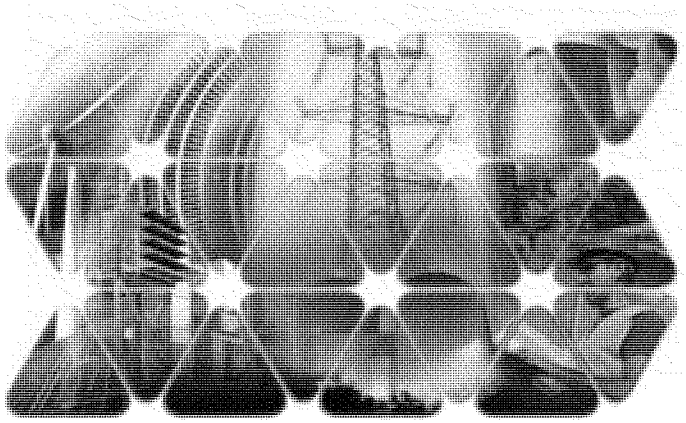

Together…Shaping the Future of Electricity

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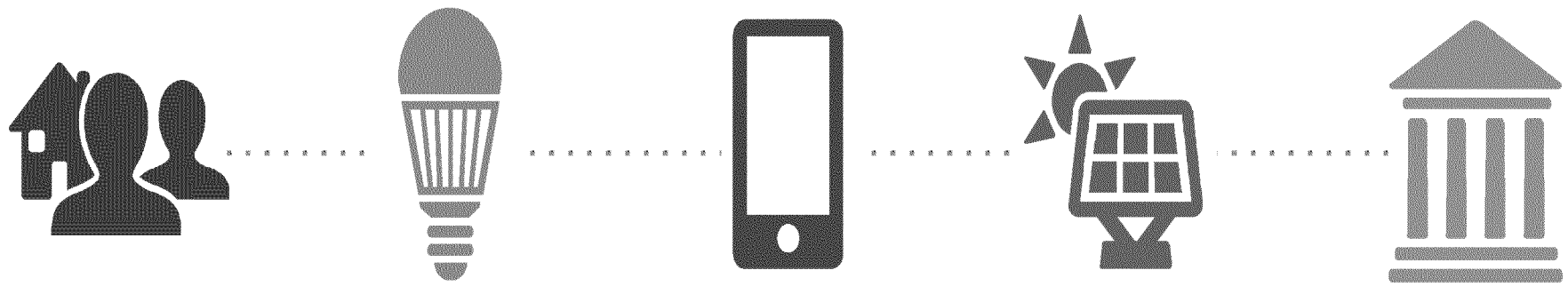
Integrated System Planning

EPRI Seminar on Fuels, Markets & Planning - November 8th, 2017

DUKE ENERGY®

Macro-trends are driving transformational change



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Energy efficiency

Gains in energy efficiency are flattening growth in energy consumption.

Technology

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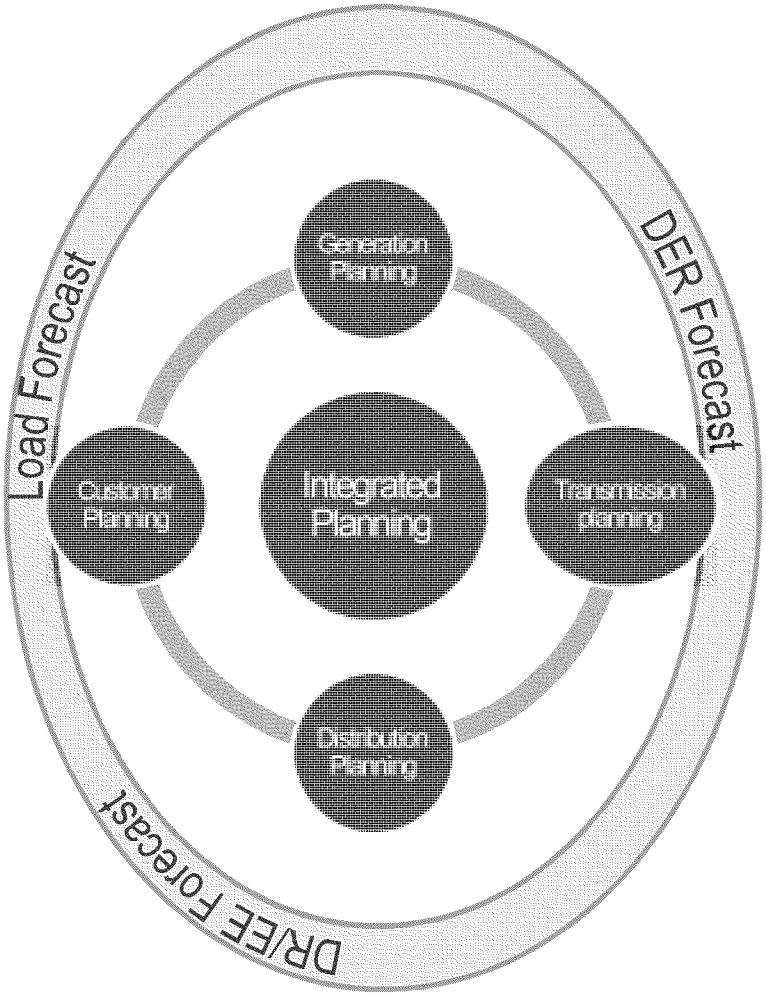
Fuel choices

Fuel choices become even more important as demand for renewables increases.

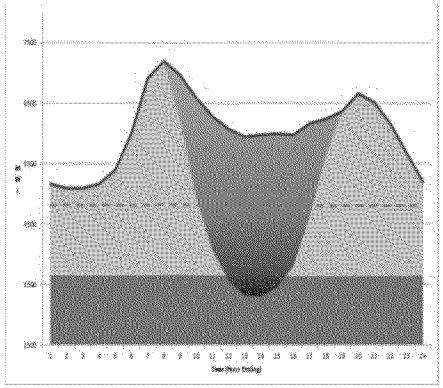
Regulatory

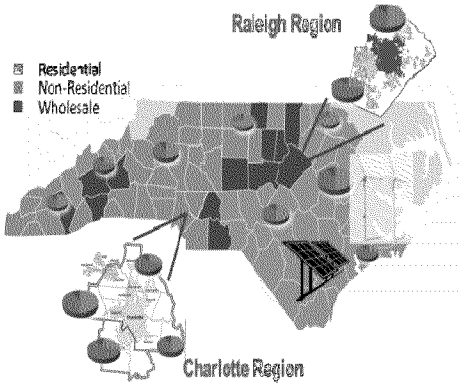
Ongoing discussions around the utility of the future.

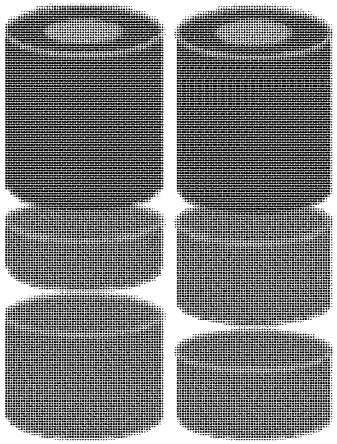
Integrated planning must capture value across the system

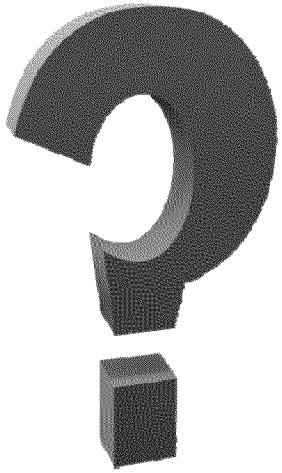


Integrated planning must mirror operational realities









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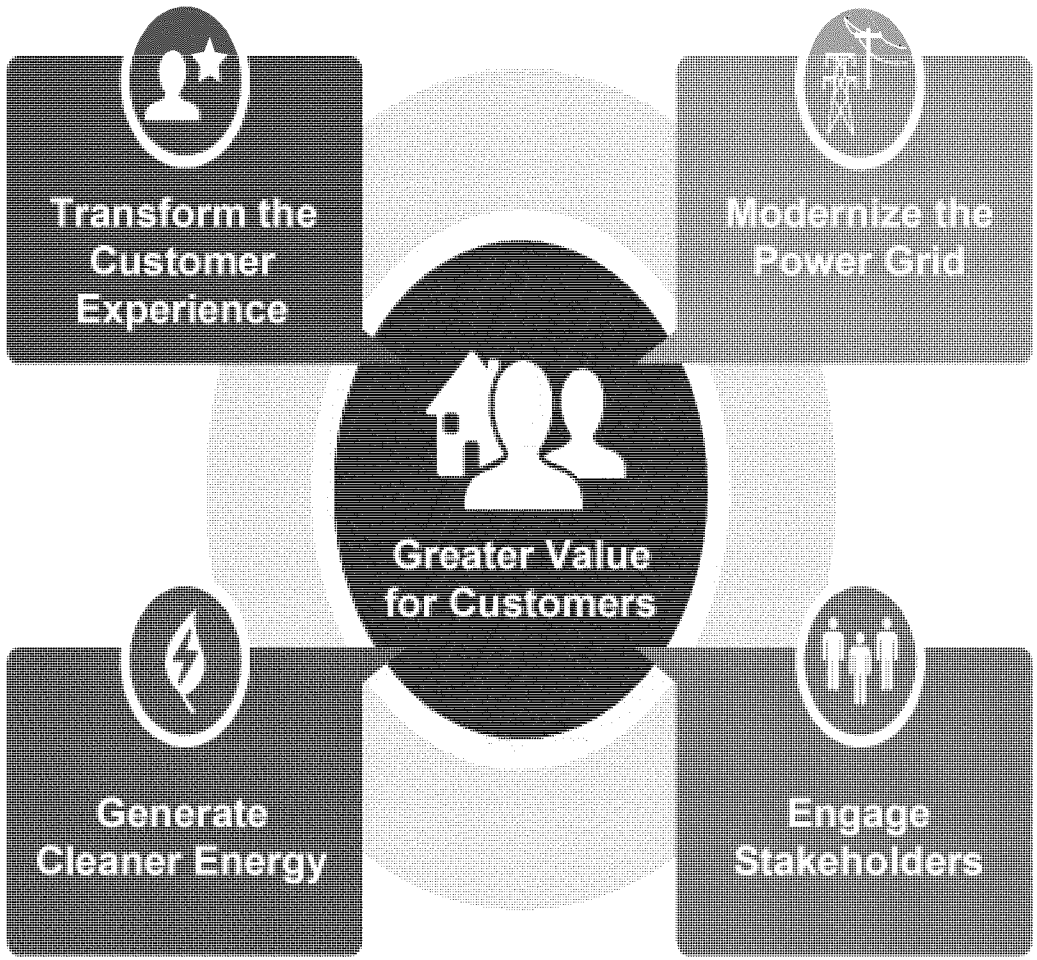

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Integrated Resource Planning

GHG reduction in California

EPRI 2017 Annual Seminar on Fuels, Power Markets and Resource Planning

Jenifer Hedrick P.E.

November 9, 2017

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- 5 million customer accounts
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Significant infrastructure investment

- 1.4 million power poles
- 729,000 transformers
- 119,000 miles of distribution and transmission lines
- 3,200 MW owned generation

Above average rate base growth driven by

- Safety and reliability
- California's low-carbon objectives
  - Grid modernization
  - Electric vehicle charging
  - Energy storage
  - Transportation electrification (proposed)

Limited Generation Exposure

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SCE Service Territory

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https://www.edison.com/content/dam/eix/documents/investors/everts-presentations/eix-october-2017-business-update.pdf

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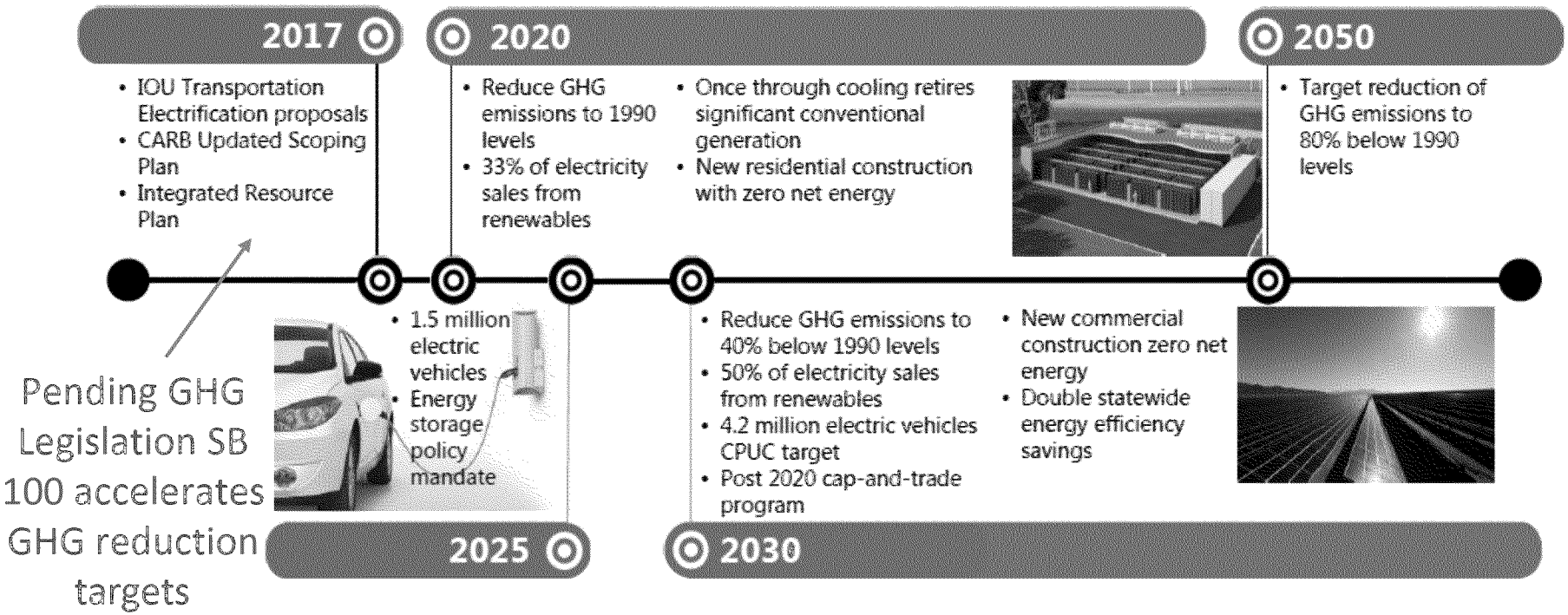
California Climate Policies – Future Timeline



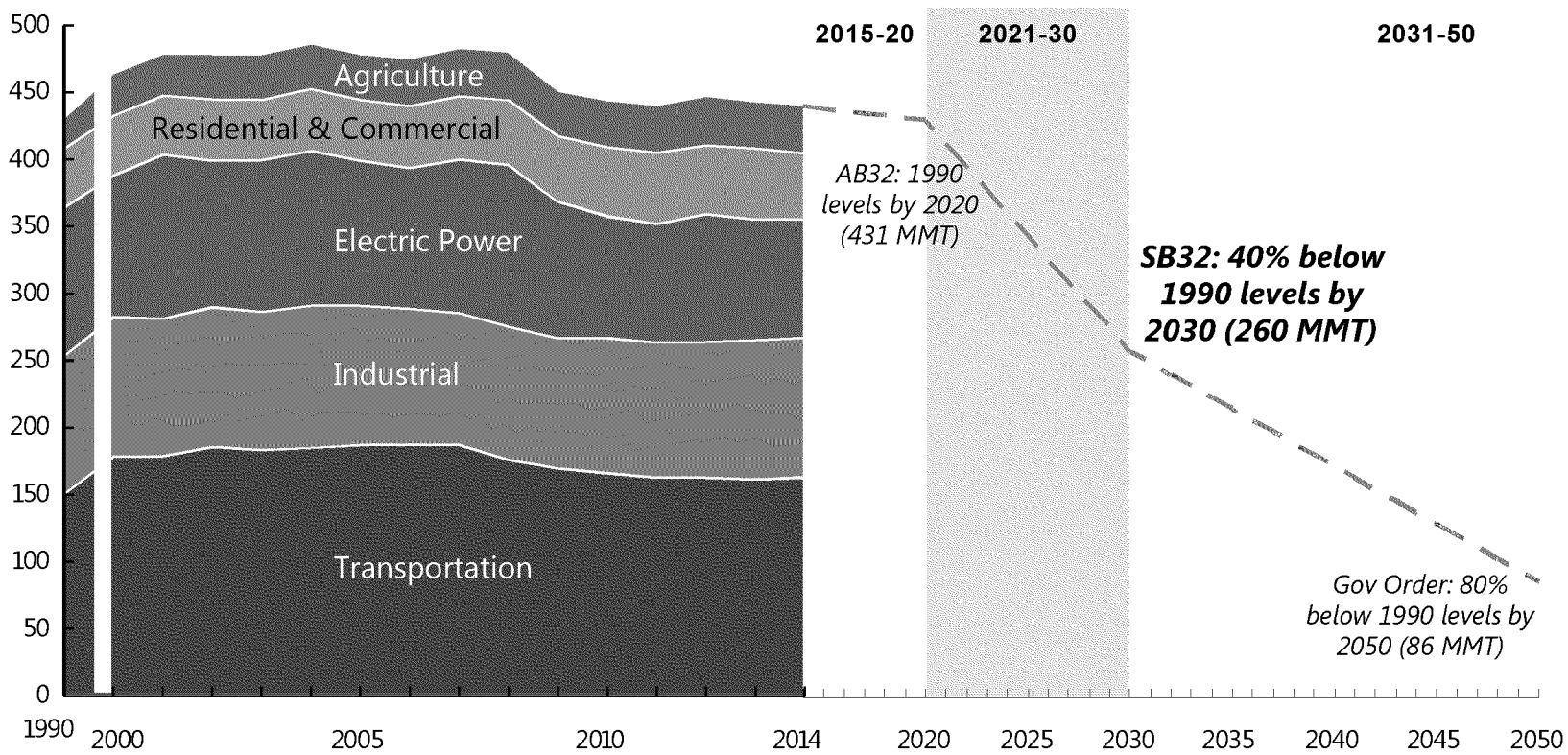
Achieving California's expansive energy and environmental policy goals will require taking foundational steps to evolve the electric grid and further develop new technologies

Source: http://www.edison.com/content/dam/eix/documents/investors/events-presentations/20170412-edison-insights-series-presentation.pdf

Achieving CA's SB32 targets in 2030 requires a dramatic acceleration of GHG emission reductions

California GHG Emissions[1]

million metric tonnes CO2 equivalent (MMT)



Source: www.arb.ca.gov/cc/inventory/data/data.htm

1) Total emissions excludes 54 MMT CO2 equivalent per AB32 definition (including portions of transportation and industrial as well as military)

ED_001523_00006048-00004

California Air Resource Board Scoping Plan

Estimated GHGs by Sector [MMTCO2e]			
	1990	2030 Scoping Plan Ranges[66]	% change from 1990
Agriculture	26	24–25	-8 to -4
Residential and Commercial	44	38–40	-14 to -9
Electric Power	108	30–53[67]	-72 to -51
High GWP	3	8–11[68]	267 to 367
Industrial	98	83–90[69]	-15 to -8
Recycling and Waste	7	8–9[68]	14 to 29**
Transportation (Including TCU)	152	103–111	-32 to -27
Natural Working Lands Net Sink*	-7***	TBD	TBD
Sub Total	**431**	**294–339**	**-32 to -21**
Cap-and-Trade Program	n/a	34–79	n/a
Total	**431**	**260**	**-40**

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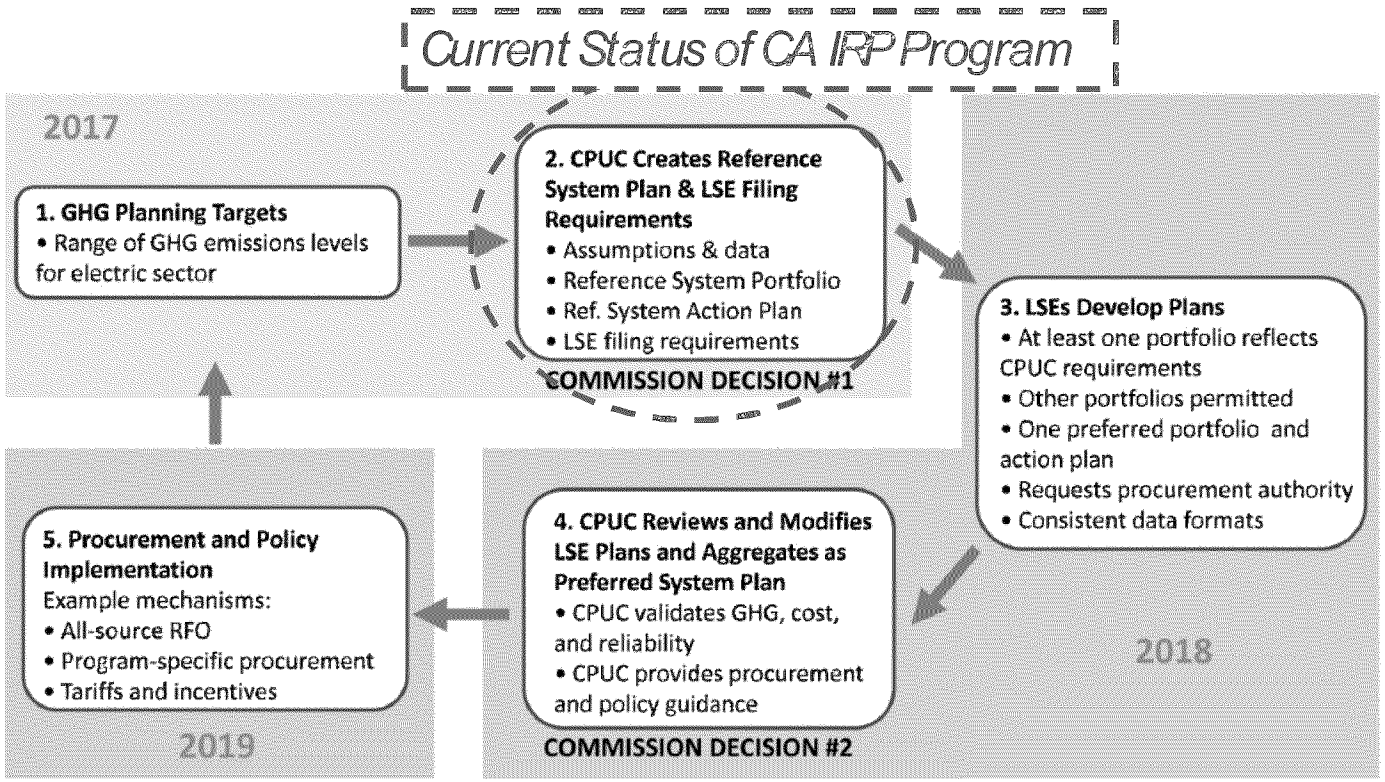
California Public Utilities Commission lead IRP process for LSEs

Proposed Two-Year IRP Process



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Impact, Scope and Schedule of IRP

IRP has the potential to re-shape California's Electric Sector Way-of-Doing-Business

- IRP becomes the state's key resource decision-making forum
  - IRP reconstructs resource planning in California
  - Centralized, not piecemeal decision making
  - Process for transparent and comparative special studies of state interest
- 'Need' is 'de-constructed' and can be any system attribute or characteristic – e.g. flexibility, VARs, replacement of usable resources with low GHG resources, solar PV and curtailment correlations, wire vs DERs, etc
- All resources to be compared on a common cost effectiveness platform
  - Procurement adders & characteristics
  - Marginal cost from IRP used to compare all resources

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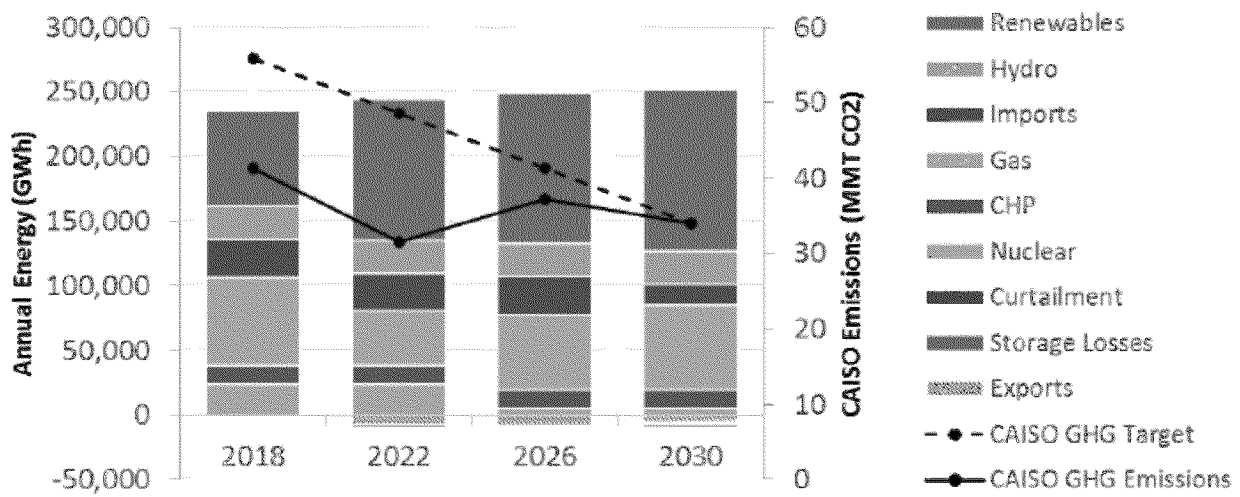
CAISO Energy Balance
42 MMT Statewide Target

2. CPUC Creates Reference System Plan & LSE Filing Requirements
- Assumptions & data
- Reference System Portfolio
- Ref. System Action Plan
- LSE filing requirements

COMMISSION DECISION #1

- Additional near term renewable build displaces energy from gas and reduces GHG emissions below GHG target in 2018 & 2022
- Energy from gas rebounds by 2026 with Diablo Canyon closure, but imports decrease to meet GHG target by 2030
- RESOLVE results show imports decline relative to in-state gas use because the GHG emissions factor that CARB assigns to imported electricity is larger than California CCGT emission factors



IV. Preliminary Results

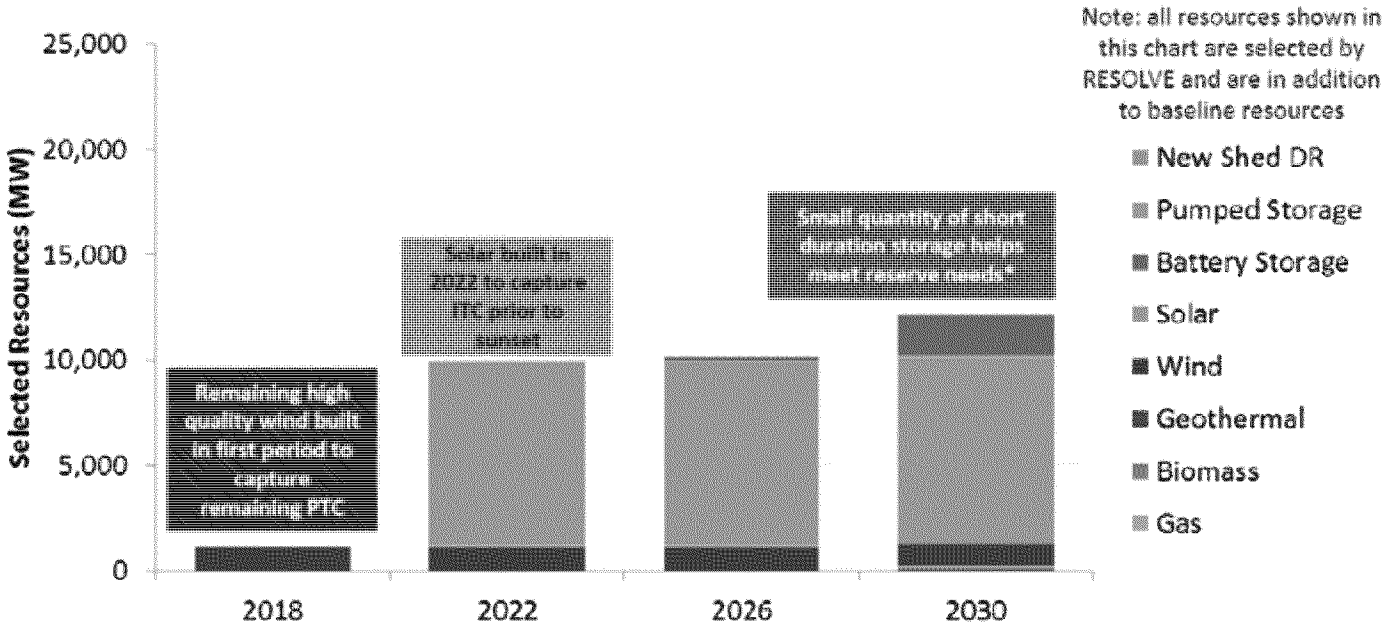
56

2. CPUC Creates Reference System Plan & LSE Filing Requirements
- Assumptions & data
- Reference System Portfolio
- Ref. System Action Plan
- LSE filing requirements

COMMISSION DECISION #1

RESOLVE Output: Resources Selected in 42 MMT Case

- Model selects ~9 GW of new utility-scale solar; 1,100 MW in-state wind; and 2,000 MW battery storage in addition to expected baseline of EE, DR, storage, renewables, hydro, gas, and nuclear
- Few additional resources needed for balancing (no new gas or pumped storage; 200 MW geothermal)
- Total incremental cost is $239 million/year, equivalent to approximately a 1% increase in system average rates by 2030



* Short-duration services could be provided by "Shimmy DR" resources, which were not modeled explicitly but may have resource potential up to 300 MW. The timing of the need for short duration services is based on a calculation of load-following reserve requirements outside of RESOLVE. There may be benefits to earlier procurement than shown here.

2. CPUC Creates Reference System Plan & LSE Filing Requirements
- Assumptions & data
- Reference System Portfolio
- Ref. System Action Plan
- LSE filing requirements

COMMISSION DECISION #1

RESOLVE Output: Incremental Total Resource Cost (TRC) to Meet GHG Targets

- Incremental cost of the optimal portfolios ranges from **$239 to $1,137 million per year** for the 42 MMT and 30 MMT GHG targets, respectively
- Primary driver of incremental costs is **new investment in renewables**, whose zero-carbon generation displaces emissions from thermal generation and imports

		Incremental TRC ($MM/yr)	
		42 MMT	30 MMT
Incremental Fixed Costs	*Renewables*	+$843	+$2,203
	Storage	+$45	+$400
	Thermal	—	—
	DR	—	—
	Transmission	—	+$41
Incremental Variable Costs		-$650	-$1,507
Incremental DSM Program Costs		—	—
Incremental Customer Costs		—	—
Incremental Total Resource Cost		**+$239**	**+$1,137**

→ Increased investment in zero-carbon renewables is primary driver of incremental costs

No additional thermal or DR resources added to meet GHG goals

→ Little to no new transmission construction

→ Addition of renewables displaces generation from thermal resources, reducing operating costs

Because demand-side assumptions are constant between scenarios, incremental costs are zero

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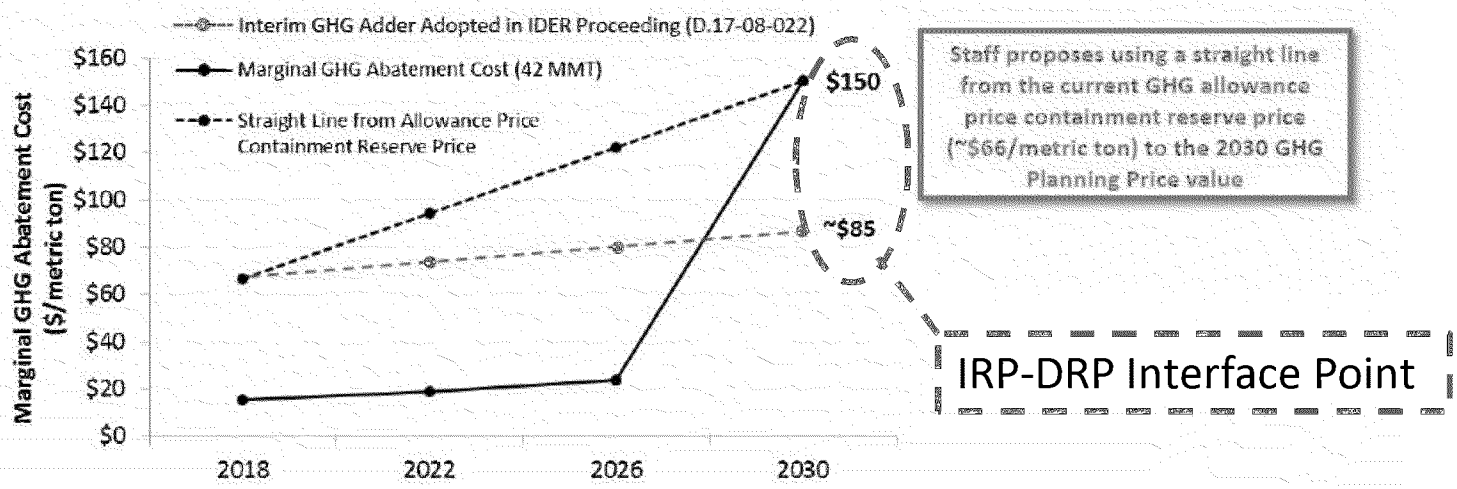
2. CPUC Creates Reference System Plan & LSE Filing Requirements
- Assumptions & data
- Reference System Portfolio
- Ref. System Action Plan
- LSE filing requirements

COMMISSION DECISION #1

GHG Planning Price

- **Recommended GHG Planning Price for IRP 2017-18: $150/MT in 2030**
  - Represents the CAISO system-wide marginal GHG abatement cost associated with achieving the 42 MMT planning target for the electric sector
  - The GHG Planning Price is an outcome of RESOLVE modeling, which constrains GHG emissions at the system level on an annual basis
  - LSEs would use the GHG Planning Price to develop their own portfolios and benchmark against resources in the Reference System Portfolio and an LSE-specific GHG Emissions Benchmark



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IRP – DRP Interface

2. CPUC Creates Reference System Plan & LSE Filing Requirements
- Assumptions & data
- Reference System Portfolio
- Ref. System Action Plan
- LSE filing requirements

COMMISSION DECISION #1

R.16-02-007 JF2/jt2

IDER

[Integrated Distributed Energy Resources]

Conclusions:

- IRP has the ability to produce marginal abatement prices that reflect the system-wide marginal resource abatement cost associated with achieving certain targets, such as GHG or RPS targets

Implications:

- Other proceedings can use marginal abatement prices provided by IRP in their planning, valuation, and procurement processes

Action Items:

- IRP should determine how marginal abatement prices (i.e. the GHG Planning Price) should flow into IDER cost-effectiveness methodologies
- IRP should develop a Common Resource Valuation Methodology (CRVM) in close cooperation with IDER staff
- Staff should identify specific data needs and timing of information flows between IDER and IRP

IRP – DRP Interface

R.16-02-007 JF2/jt2

2. CPUC Creates Reference System Plan & LSE Filing Requirements
- Assumptions & data
- Reference System Portfolio
- Ref. System Action Plan
- LSE filing requirements

COMMISSION DECISION #1

DRP (1 of 2)

[Distribution Resources Plan]

Conclusions

There are two major interaction areas between IRP and DRP:

- Grid integration costs and benefits of DERs at system level need to be calculated
  - RESOLVE does not currently account for grid integration costs and benefits of DERs
  - DRP future refinements to the locational net benefit analysis (LNBA) include calculation of net DER integration costs at the Distribution Planning Area level, but calculation of a system level costs/benefits is not currently in scope of LNBA working group
- Transparent and consistent DER growth forecasts are needed for both IRP and DRP
  - IRP needs a clear set of planning assumptions in order to run scenarios on the impact of policy levers on each DER
  - DRP staff is coordinating CEC on development of DER growth scenarios, and ensuring the process will meet IRP needs
  - Currently discussing what adjustments may be needed to the IEPR demand forecast process to meet IRP and DRP needs

IRP – DRP Interface

2. CPUC Creates Reference System Plan & LSE Filing Requirements
- Assumptions & data
- Reference System Portfolio
- Ref. System Action Plan
- LSE filing requirements

COMMISSION DECISION #1

R.16-02-007 JF2/jt2

DRP (2 of 2)

[Distribution Resources Plan]

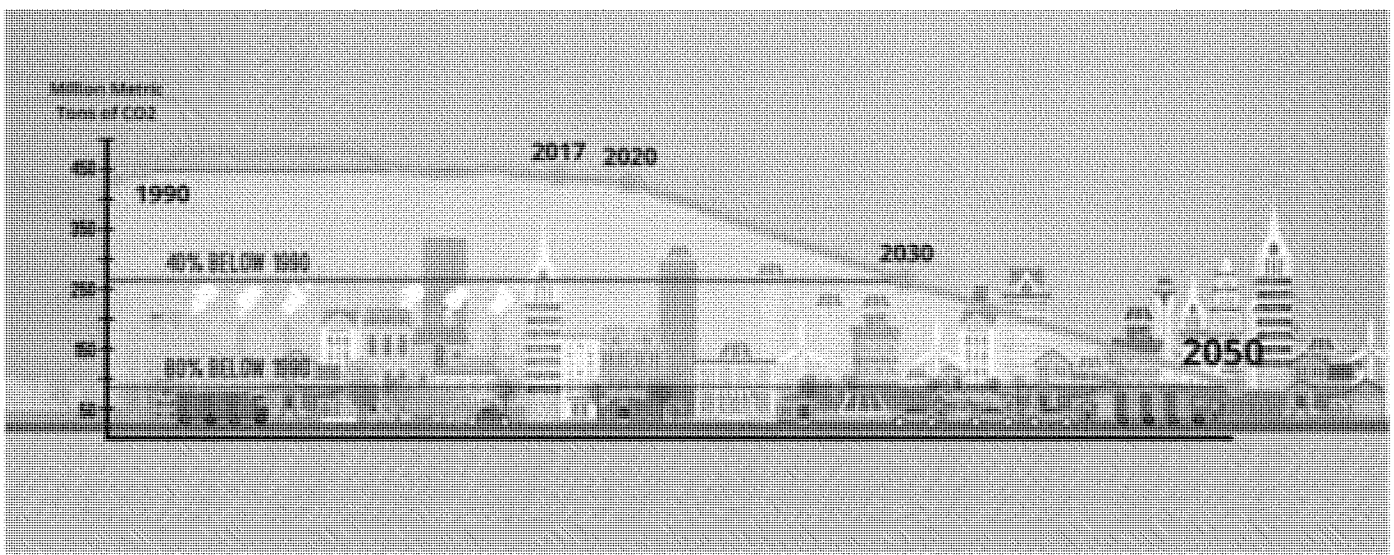
Implications:

- DRP and IRP comprise a feedback loop: DER growth depends on the cost-effectiveness of DER relative to other GHG free resources, which depends on costs of grid integration of DERs, which in turn depends on DER growth
- This feedback loop makes the assessment of DER growth and cost effectiveness complex, and by necessity an iterative process
  - DRP will not inform the 2017-2018 IRP planning cycle or vice versa, but results will be for the following cycle
  - IRP guidance from the optimized portfolio is expected to flow through to policy revisions in CPUC resource proceedings, and then the IEPR forecast, before becoming new DRP DER growth scenarios
- New analysis that pulls together results of LNBA in order to understand impacts at a system level may be needed

Action Items:

- DRP to develop a plan for determining system level grid integration costs/benefits
- DRP to work with CEC to define planning assumptions for DER growth
- DRP staff to determine how optimization of DERs in future IRP cycles will impact DER growth forecasts
- DRP to identify which DERs are driving specific grid needs, so that grid planning can adjust to changing market adoption rates

Questions?



The Clean Power and Electrification Pathway

U.S. DEPARTMENT OF
ENERGY

Office of
Electricity Delivery
& Energy Reliability

Energy System Resilience

36th Annual Seminar on Fuels, Power Markets and Resource Planning

Katie Jereza, Deputy Assistant Secretary

November 9, 2017

November is…

Critical Infrastructure Security and Resilience Month

ALL Americans

ACCESS

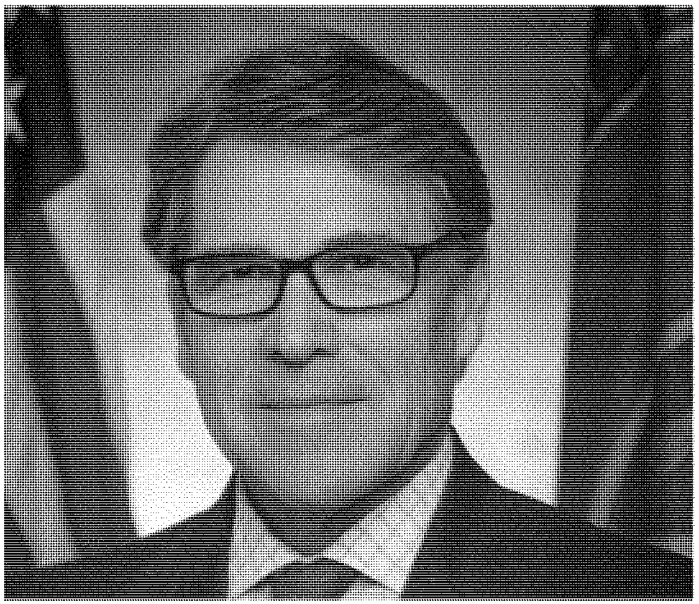
Electricity underpins ALL

ED_001523_00006049-00002

Secretary Perry Requested a Grid Study in April 2017

The memo asked staff to examine:

- The evolution of wholesale electricity markets
- Compensation for resilience in wholesale energy and capacity markets
- Premature baseload power plant retirements



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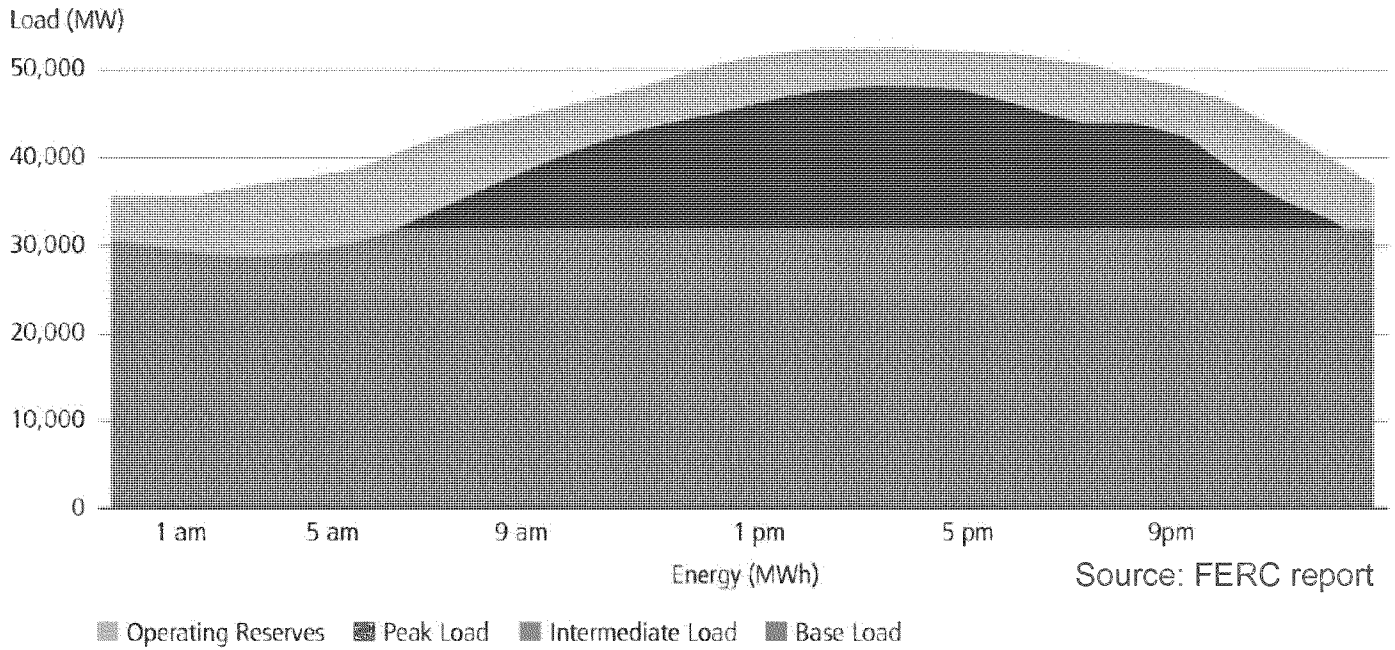
Baseload generation: *defined by operation*

Figure 1.2. Schematic of Typical Daily Load Curve Showing Base Load[13]



Source: FERC report

<u>Baseload</u> power plants:

- High, sustained output levels
- High capacity factors
- Limited cycling or ramping

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Premature retirement: *subjective term*

- Power plant engineers
- RTO/ISO/reliability organization
- Policy maker or legislator
- Mayor or employee
- Merchant competitor
- Vertically integrated utility executive
- Nuclear or hydroelectric plant owners and regulators
- Electricity economists

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Retirements: Key drivers

1. Advantaged economics of natural gas-fired generation
2. Low growth in electricity demand
3. Investments in environmental regulations
4. Dispatch of VRE

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Reliability: PJM's perspective

● = Exhibits Attribute
◐ = Partially Exhibits Attribute
○ = Does Not Exhibit Attribute

Resource Type	Essential Reliability Services (Frequency, Voltage, Ramp Capability)					Fuel Assurance		Flexibility			Other		
	Frequency Response (Inertia & Primary)	Voltage Control	Ramp										
			Regulation	Contingency Reserve	Load Following	Not Fuel Limited (> 72 hours at Eco. Max Output)	On-site Fuel Inventory	Cycle	Short Min. Run Time (< 2 hrs.)/ Multiple Starts Per Day	Startup/ Notification Time < 30 Minutes	Black Start Capable	No Environmental Restrictions (That Would Limit Run Hours)	Equivalent Availability Factor
Hydro	●	●	●	●	●	○	◐	●	●	●	●	◐	●
Natural Gas - Combustion Turbine	●	●	◐	●	◐	●	○	●	●	●	●	◐	◐
Oil -Steam	●	●	●	●	●	●	●	●	○	○	○	○	◐
Coal - Steam	●	●	●	●	●	●	●	◐	○	○	○	◐	◐
Natural Gas - Steam	●	●	●	●	●	●	○	●	○	○	●	◐	◐
Oil/ Diesel - Combustion Turbine	●	●	○	●	○	○	●	●	●	●	●	○	◐
Nuclear	◐	●	○	○	◐	●	●	○	○	○	○	◐	●
Battery/ Storage	◐	◐	●	●	○	○	○	●	●	●	◐	●	●
Demand Response	○	○	◐	◐	◐	◐	◐	●	●	◐	○	●	●
Solar	◐	◐	○	○	◐	○	○	●	●	●	○	●	●
Wind	◐	◐	○	○	◐	○	○	●	●	●	○	◐	●

- **PJM: determine how different resources can provide ERS**
- **More work is needed to fully define, value, procure, and compensate ERS**

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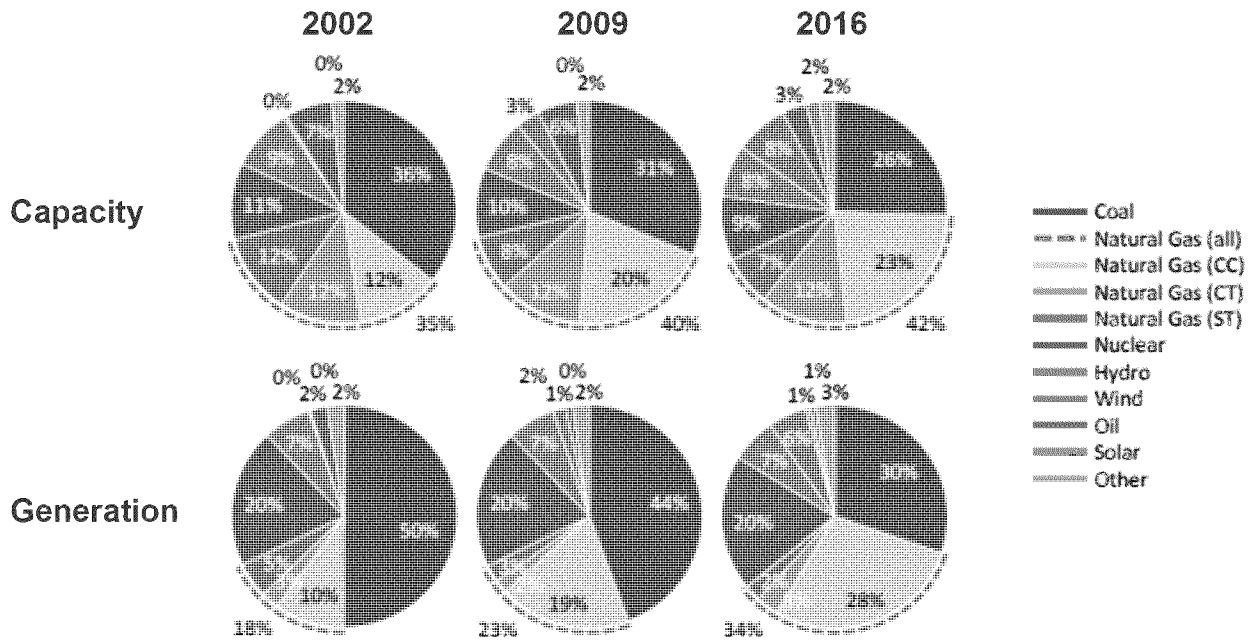
Reliability vs. Resilience



PJM simulation: when 98 *reliable* portfolios were subjected to a polar vortex event, only 34 were also *resilient*

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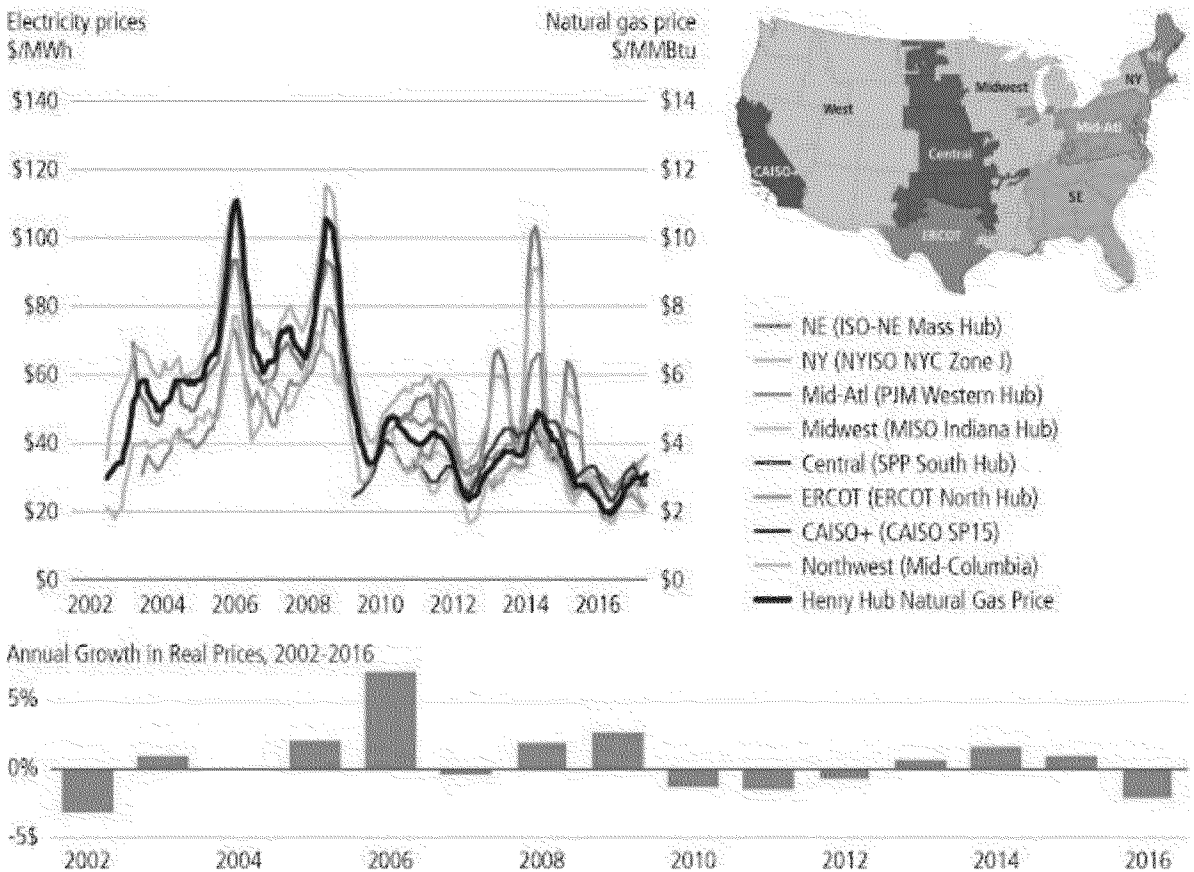
Affordability



- **Wholesale-retail disconnect**
- **Limited work done to-date on the affordability of the BPS as a system or portfolio**

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Policy recommendations

Department of Energy

- Support industry efforts and focus R&D to enhance system resilience (for example, OE awards)
- Accelerate and reduce costs for re/licensing and permitting
- Facilitate programs for workforce development
- Prioritize energy dominance and EO 13783
- Increase coordination of electric and natural gas industries

Federal Energy Regulatory Commission (FERC)

- Expedite efforts to reform energy price formation
- Value new/existing essential reliability services

Environmental Protection Agency (EPA)

- Allow coal-fired power plants to improve efficiency and reliability without triggering new regulatory approvals and associated costs

Nuclear Regulatory Commission (NRC)

- Revisit nuclear safety rules
- Ensure safety without unnecessarily adding costs

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Areas for further research

Market Structure and Pricing	Reliability and Resilience	Cost and Affordability	Regulatory
Study mechanisms to enable equitable, value- based remuneration for desired grid attributes	Develop policy metrics and tools for evaluating system-wide provision of these attributes	Estimate system-wide costs of different generation mixes and sensitivities to fuel price fluctuations	Explore potential to utilize existing authorities to ensure system reliability and resilience
Evaluate ongoing capacity market reforms	Examine ways to improve power generator fuel delivery data collection	Update analysis of subsidies and support for electricity production	Explore costs and benefits of states applying cost-of-service regulation to at-risk plants

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Electricity Underpins All Infrastructures

Moving forward…

Be proactive

Cultivate an ecosystem

Reliable, affordable, resilient energy

ED_001523_00006049-00012

PJM's Evolving Resource Mix and System Reliability

M. Gary Helm
Natalie Tacka

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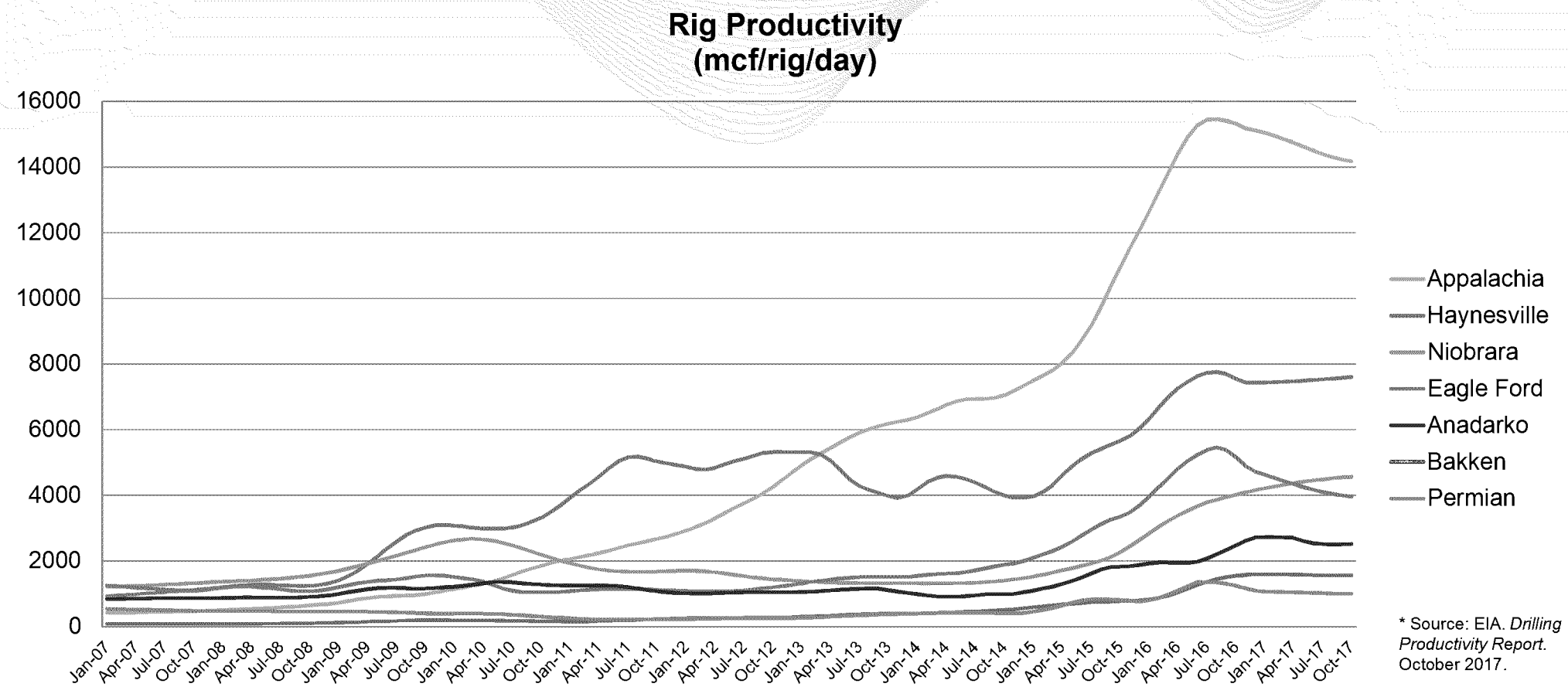
Main Driver: Natural Gas



* Source: EIA. *Drilling Productivity Report*. October 2017.

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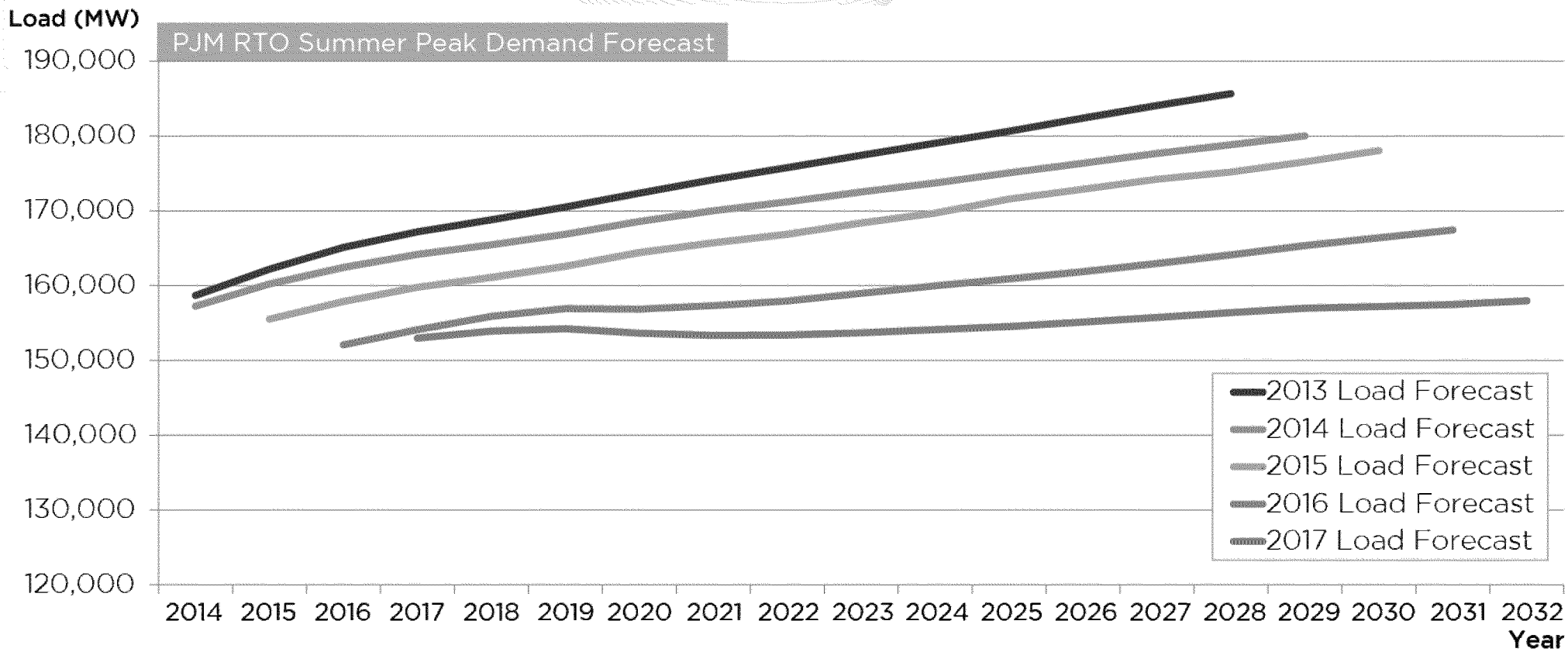
Declining Electricity Demand Growth



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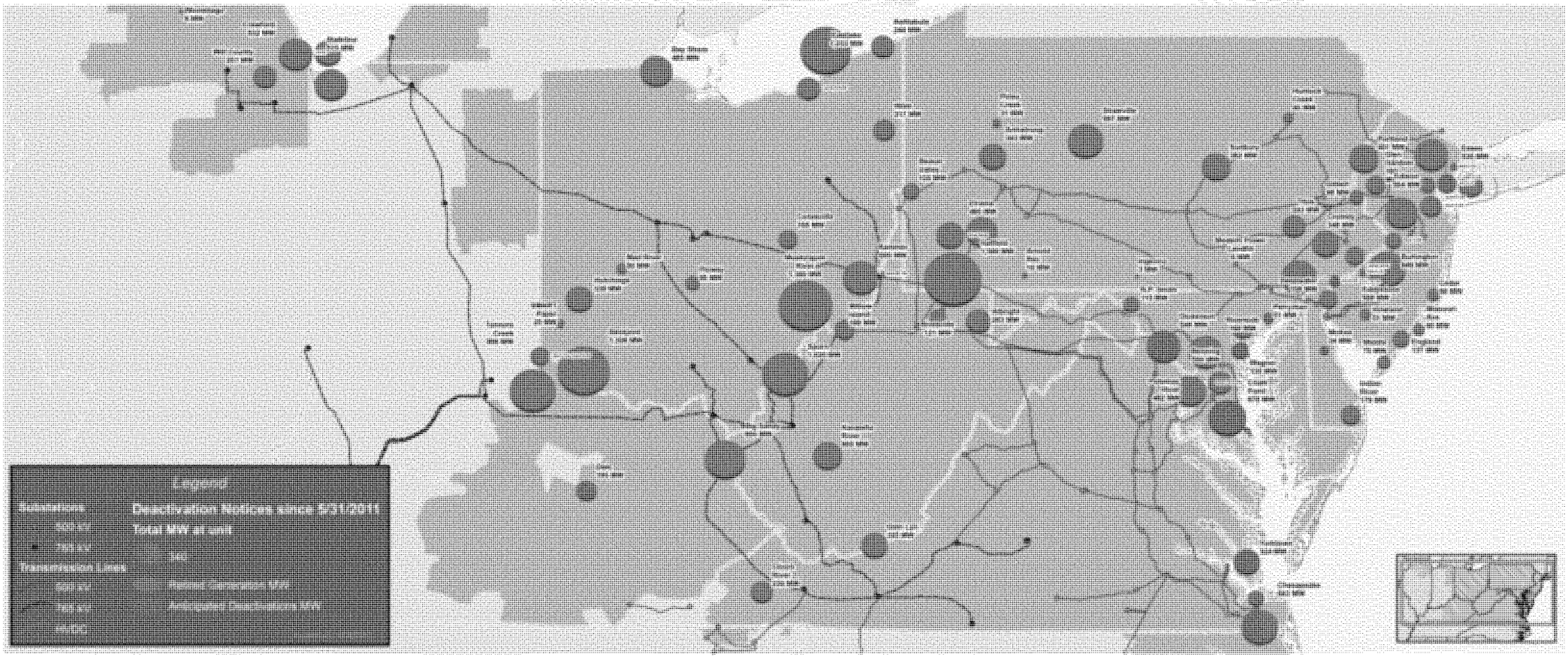
Generation Retirements



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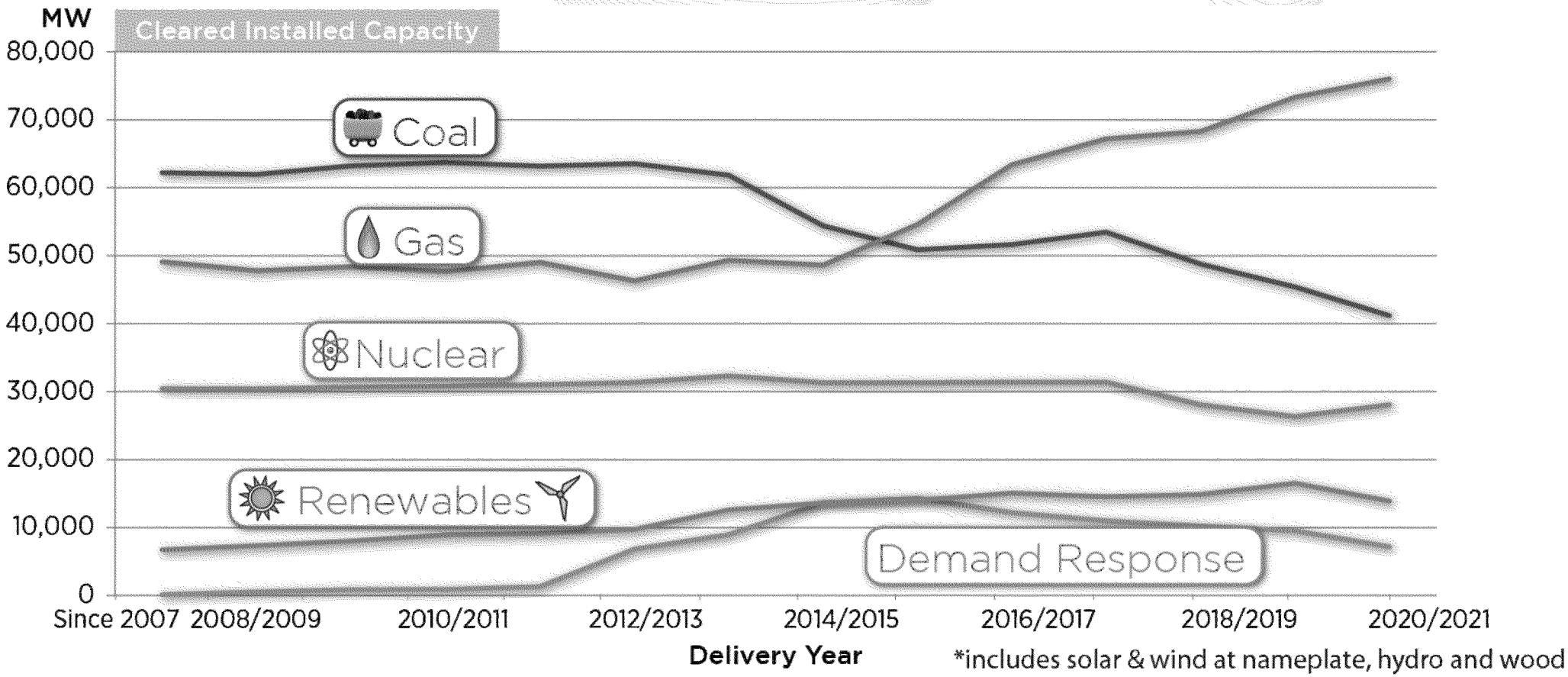
Capacity Market Results



*includes solar & wind at nameplate, hydro and wood

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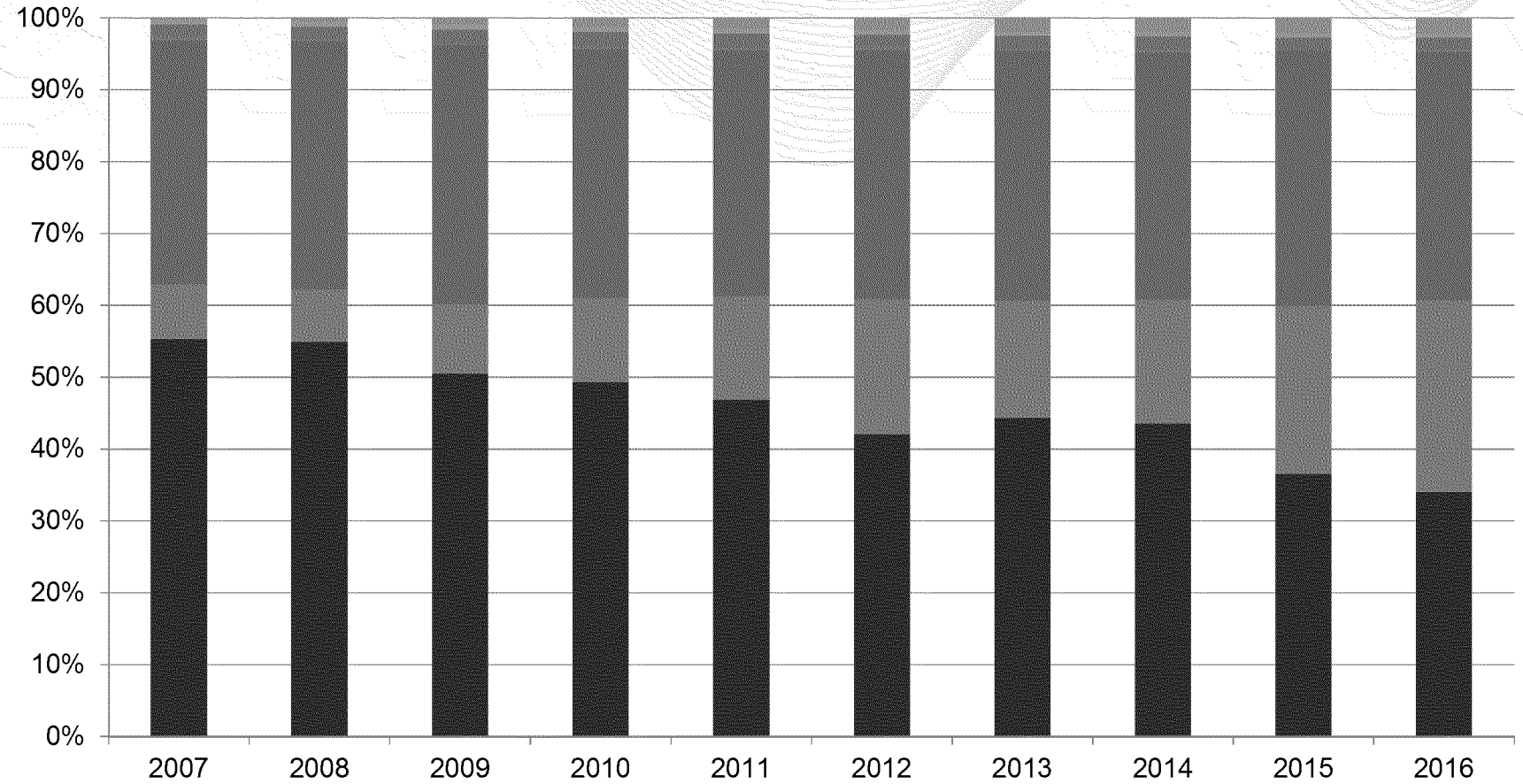
Changing Energy Market Trends



* Source: Monitoring Analytics, LLC. *2016 State of the Market Report for PJM*. Mar. 9, 2017.

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Focus

- Define resource diversity
- Define reliability attributes and measure capabilities of different resource types to provide these attributes
- Analyze resource diversity trajectory and potential impacts on reliability

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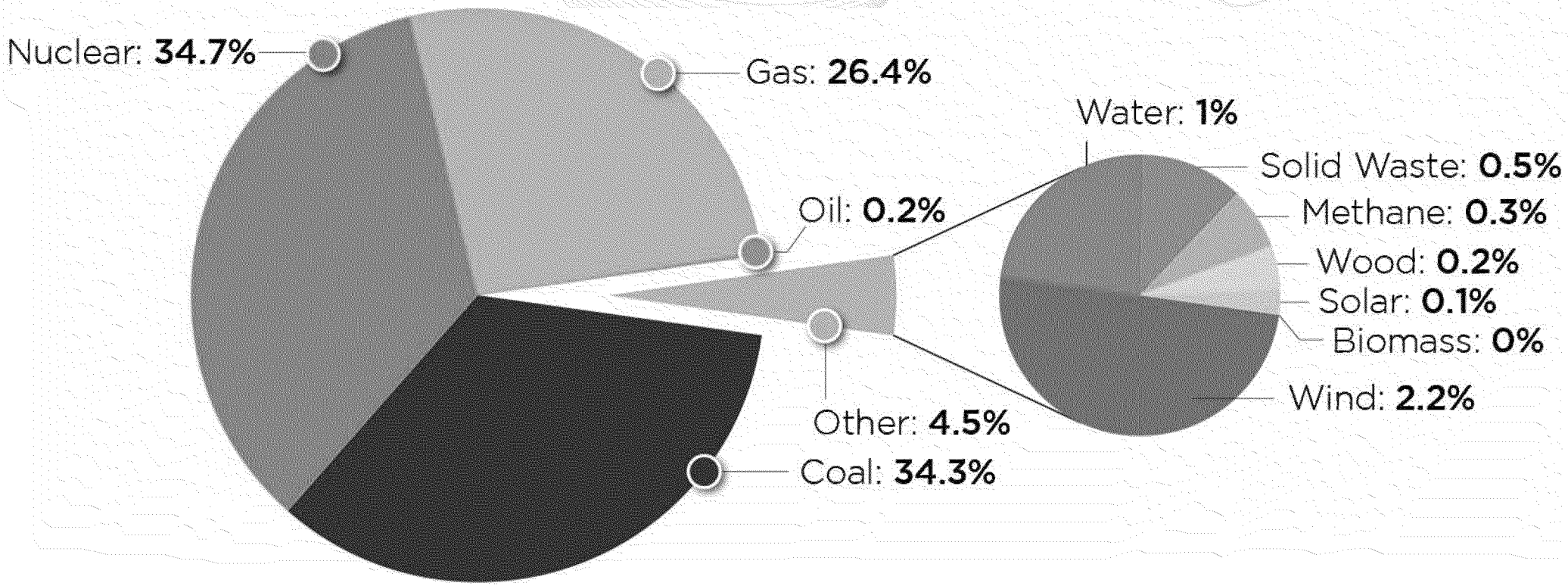
Variety & Balance



(% Annual Energy)

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Essential Reliability Attributes

● = Exhibits Attribute
◓ = Partially Exhibits Attribute
○ = Does Not Exhibit Attribute

Resource Type	Essential Reliability Services (Frequency, Voltage, Ramp Capability)					Fuel Assurance		Flexibility			Other		
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Oil -Steam	●	●	●	●	●	●	●	●	○	○	○	○	◓
Coal - Steam	●	●	●	●	●	●	●	◓	○	○	○	◓	◓
Natural Gas - Steam	●	●	●	●	●	●	○	●	●	●	●	◓	◓
Oil/ Diesel - Combustion Turbine	●	●	○	●	○	○	●	●	●	●	●	●	●
Nuclear	◓	●	○	○	◓	●	●	●	●	●	●	●	●
Battery/ Storage	◓	◓	●	●	○	○	○	●	●	●	●	●	●
Demand Response	○	○	◓	◓	◓	◓	◓	●	●	◓	○	●	●
Solar	◓	◓	○	○	◓	○	○	●	●	●	○	●	●
Wind	◓	◓	○	○	◓	○	○	●	●	●	○	◓	●

Capabilities needed by the grid to ensure reliability

Contribution of each resource type to a particular attribute

Qualitative approach to describing resource attributes essential for system reliability

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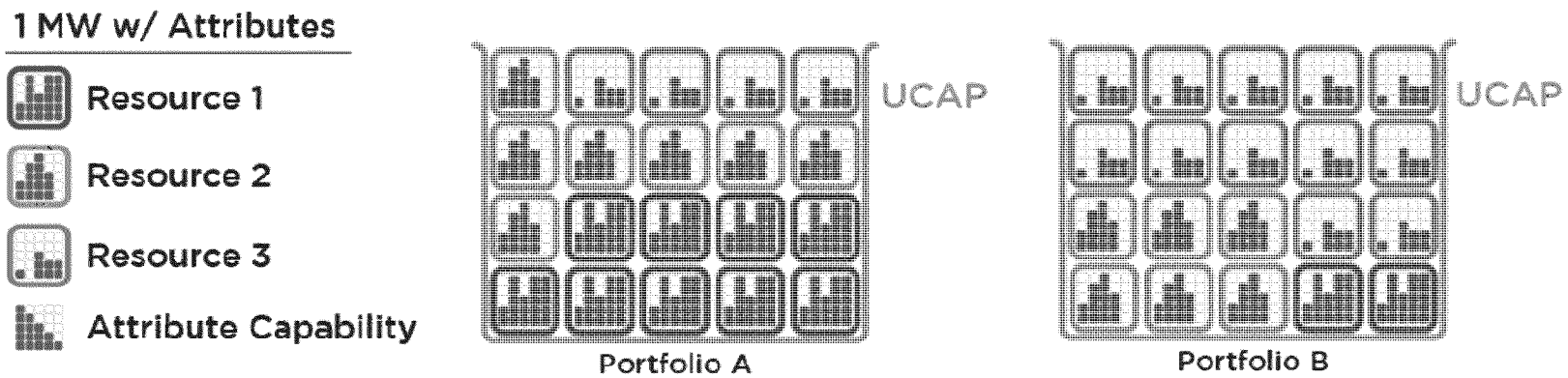
Specific Reliability Attributes

Different resource types have different operational characteristics that aid in maintaining system reliability



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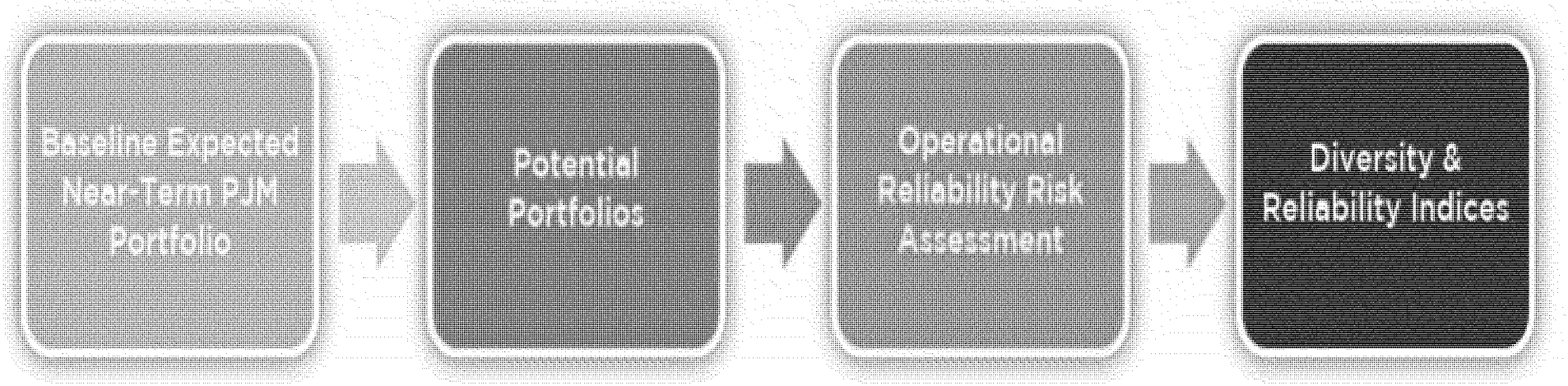
Approach



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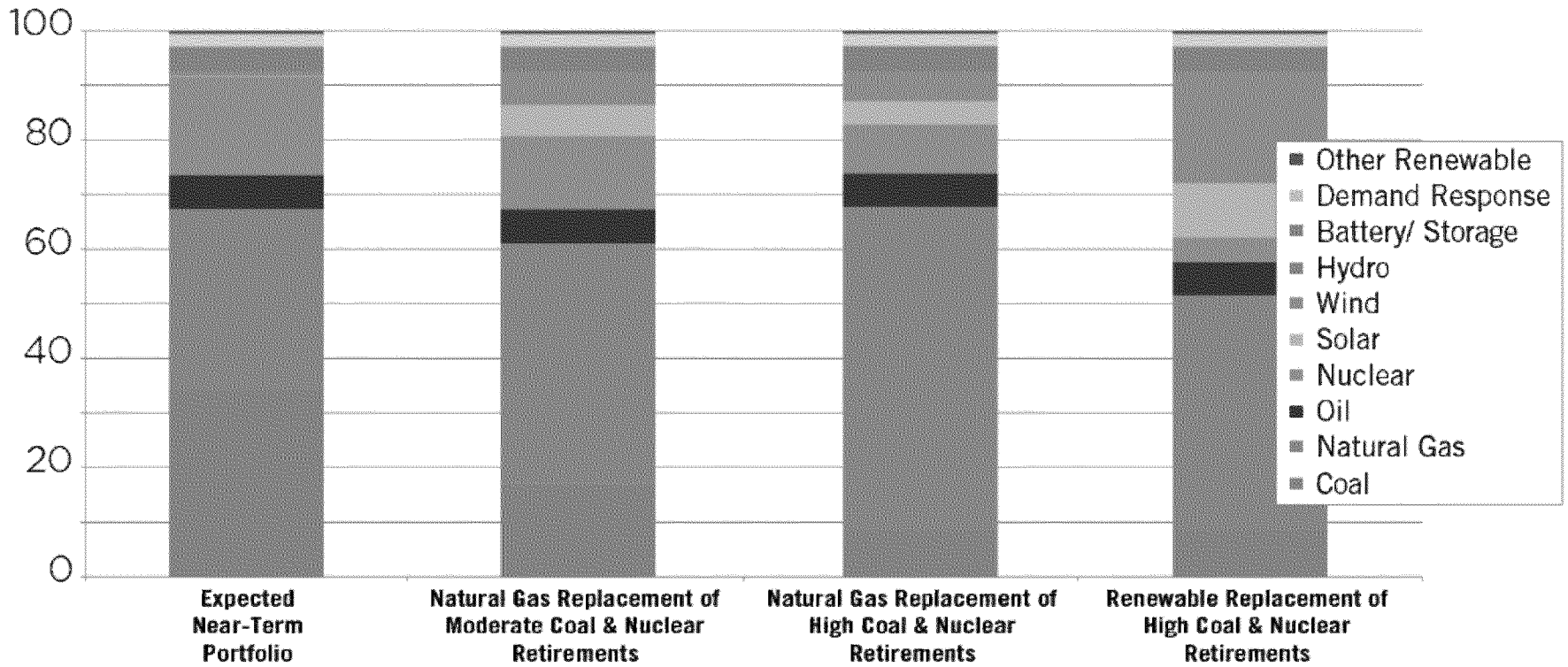
Establish Portfolios



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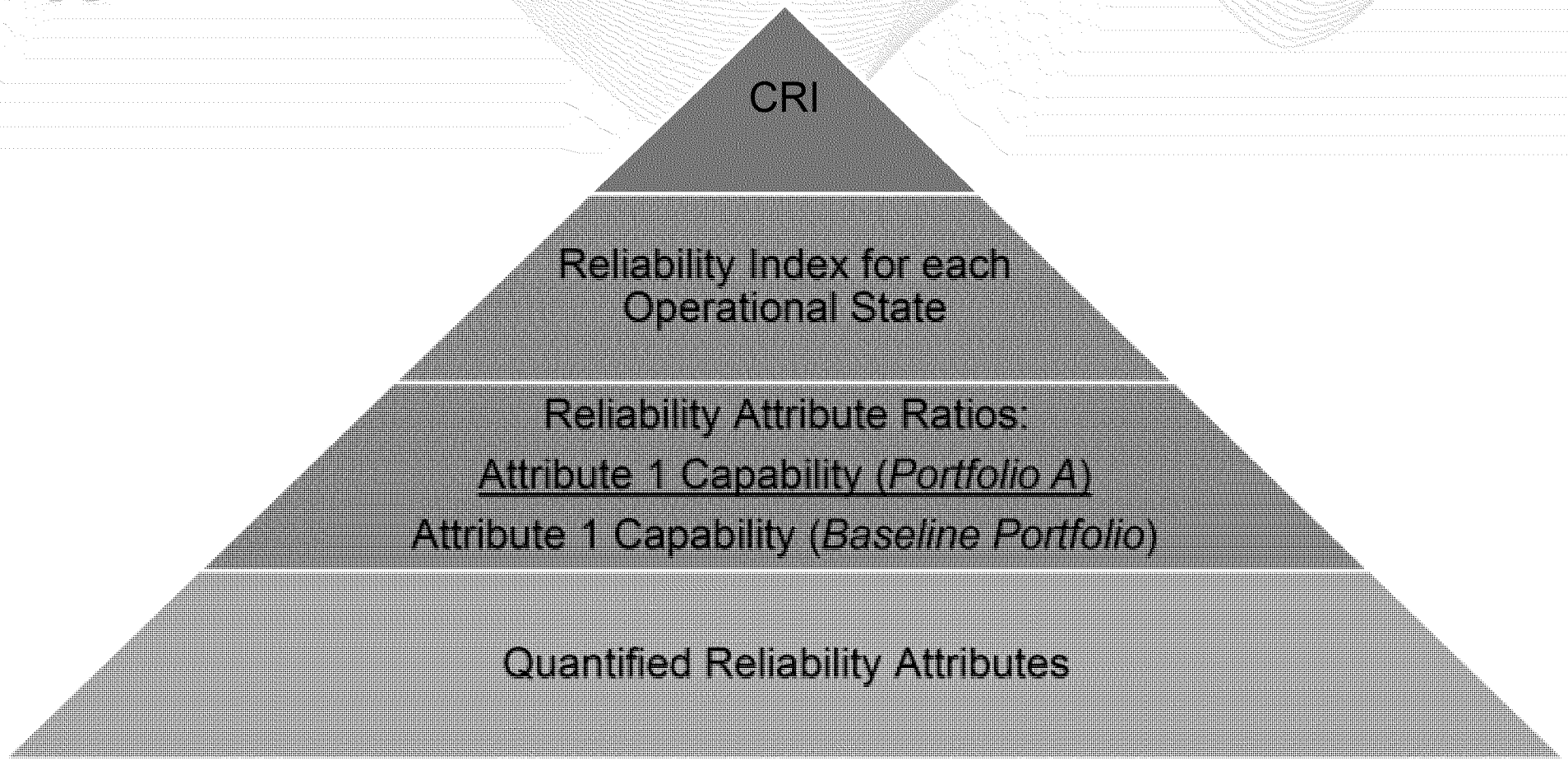
Composite Reliability Attribute



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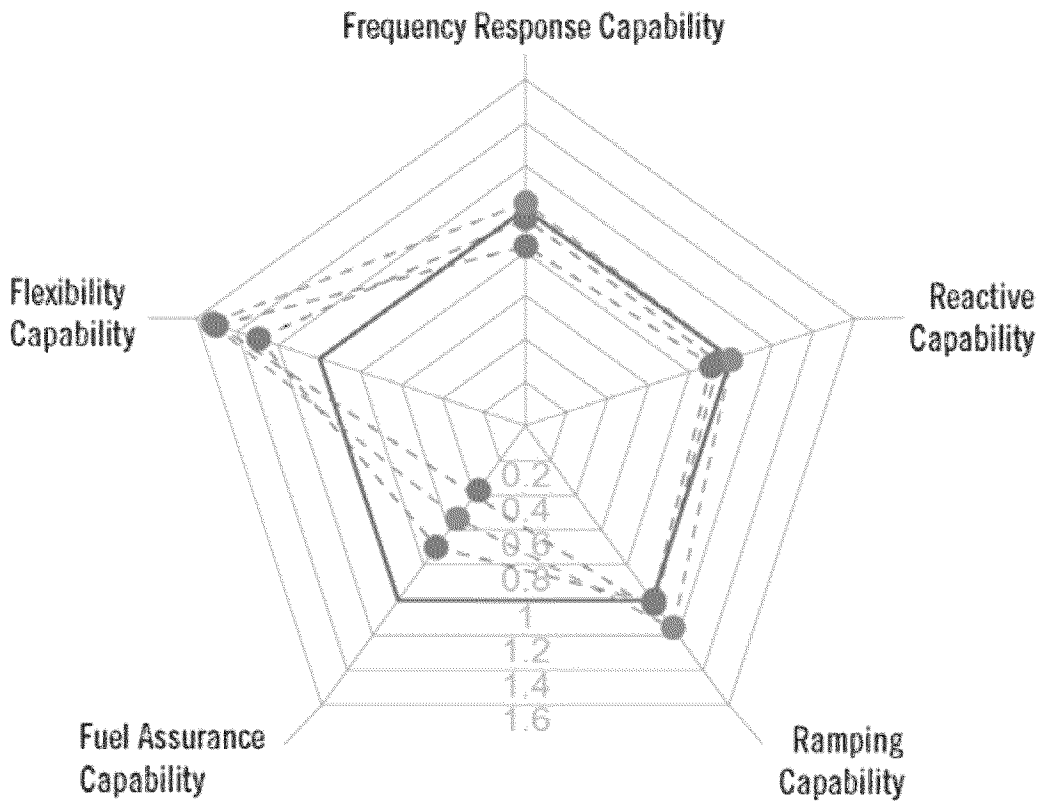
Findings - Reliability Attribute Capability



- Expected Near-Term Portfolio
- Natural Gas Replacement of Moderate Coal & Nuclear Retirements
- Natural Gas Replacement of High Coal & Nuclear Retirements
- Renewable Replacement of High Coal & Nuclear Retirements

Illustrative Future Portfolios

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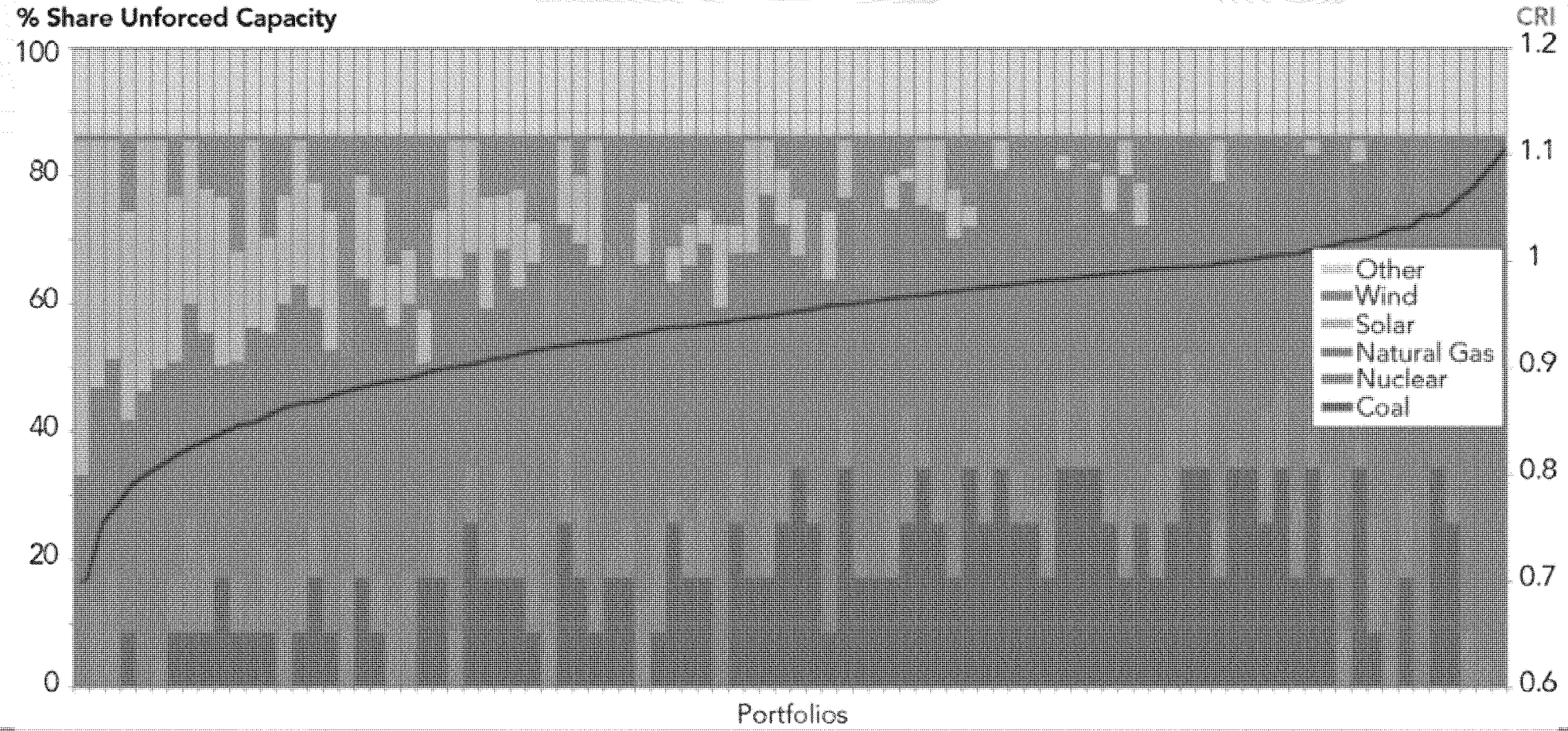
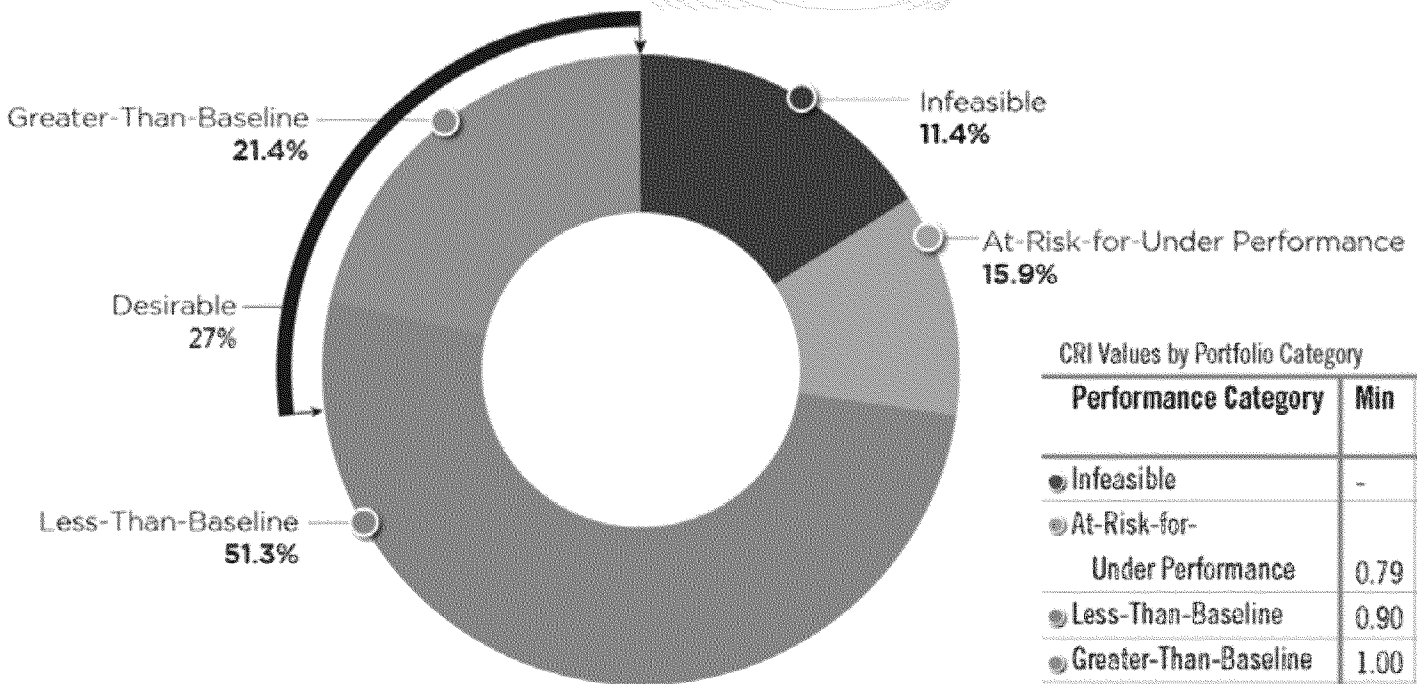
Findings – Reliability Index



Distribution of Results



CRI Values by Portfolio Category

Performance Category	Min	Max	LOLE Criterion
Infeasible	-	-	Failed
At-Risk-for-Under Performance	0.79	0.90	Met
Less-Than-Baseline	0.90	0.99	Met
Greater-Than-Baseline	1.00	1.11	Met
Desirable	0.95	1.11	Met

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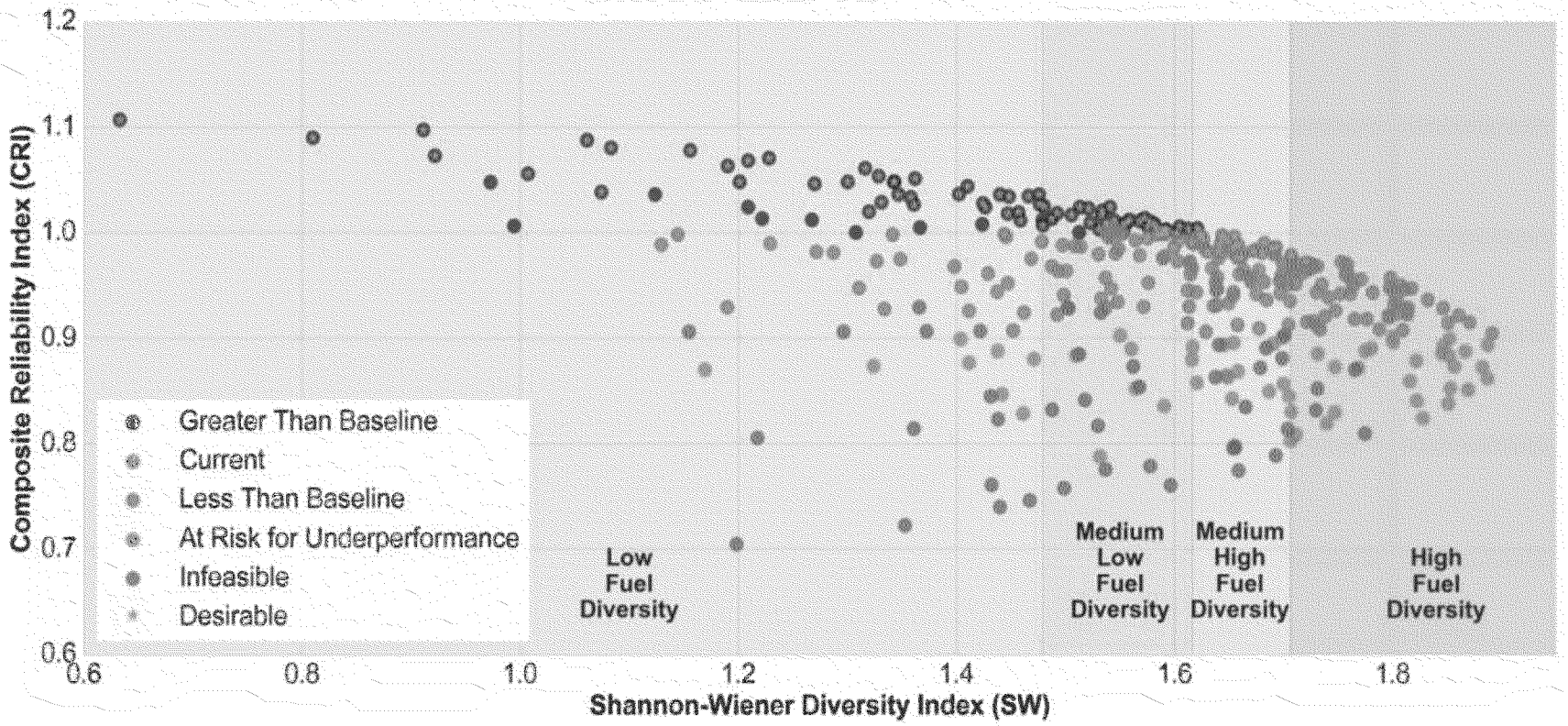
Findings - Impact of Diversity



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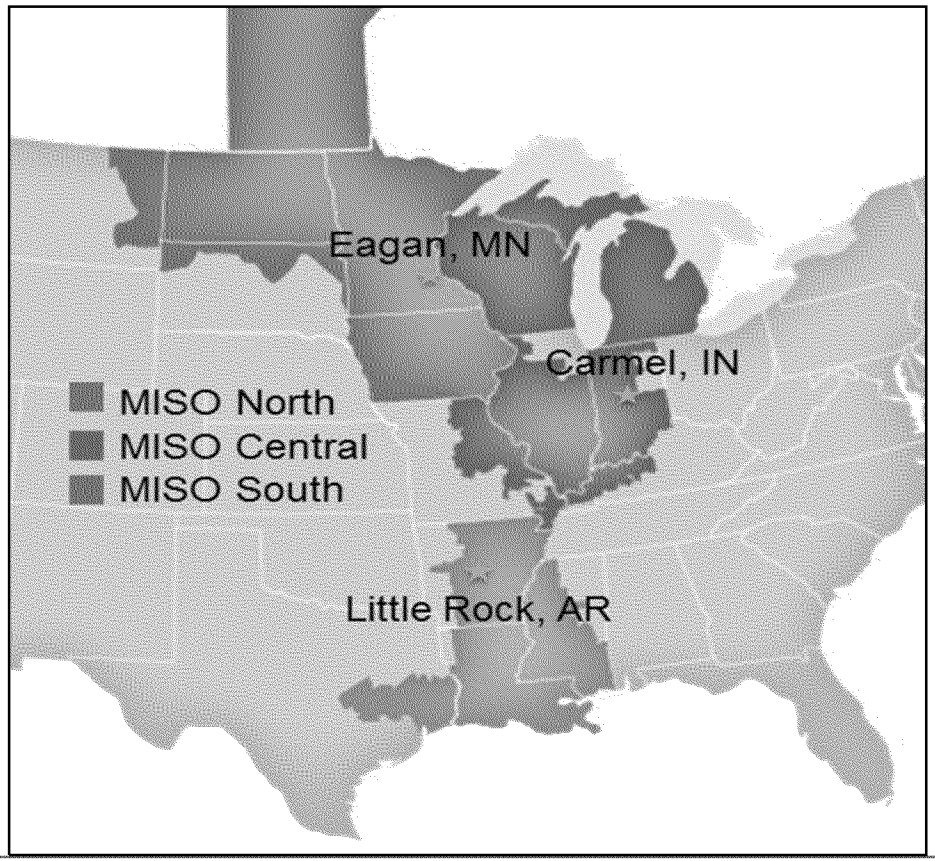
Incentivizing System Reliability and Resilience in the Wholesale Power Market

Derek Bandera, Executive Director, Federal Regulatory Affairs

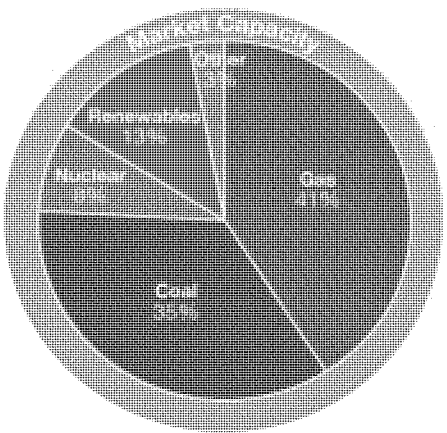
November 9th, 2017

MISO drives value creation through efficient and reliable markets, operations, planning, and innovation

The most reliable, value-creating RTO



MISO by-the-numbers	
High Voltage Transmission	65,800 miles
Generation Capacity	174,000 MW
Peak Summer System Demand	127,125 MW
Customers Served	42 Million



https://www.misoenergy.org/AboutUs/LeadershipGovernance/PublishingImages/Corporate%20Fact%20Sheet.jpg

MISO

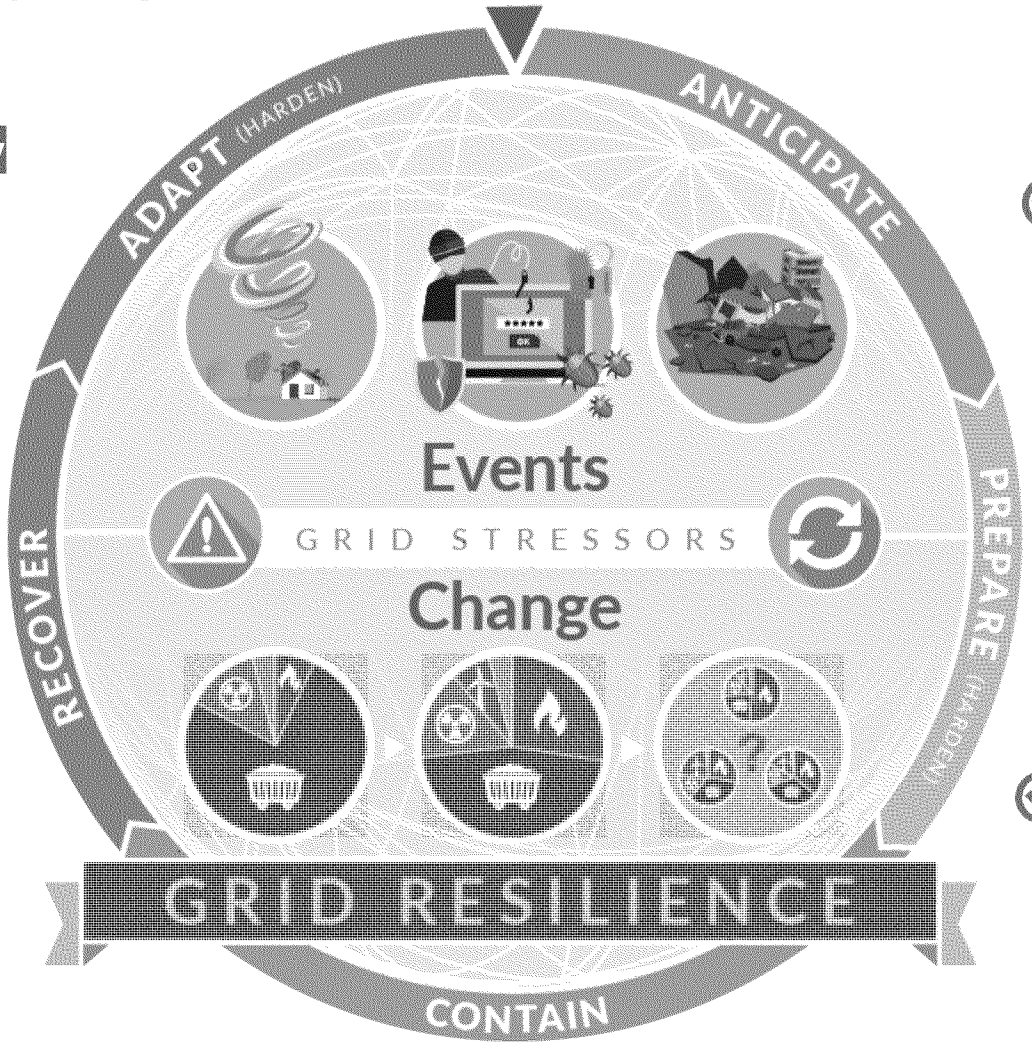
MISO's resilience efforts address all stages of an event, and a variety of grid stressors

Technology and Security

- Maturing identification, protection, detection and response capabilities

Markets

- Operating efficient markets that incent and coordinate resilient outcomes



Operations

- Improving the ability to anticipate, contain, and recover

System Planning

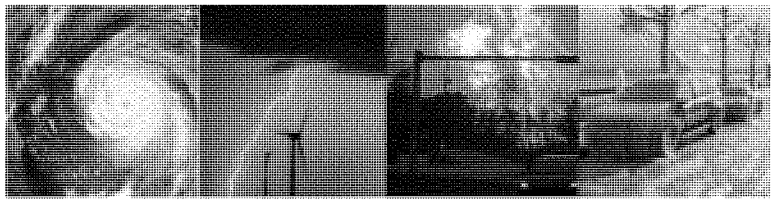
- Enhancing planning criteria to ensure a reliable, flexible transmission system

- Draws upon Department of Energy, North American Electric Reliability Corporation, and National Academy of Engineering efforts related to resilience
- The term "Electric Grid" is the interconnected network for delivering electricity and includes the generation, transmission, and distribution systems, as well as the NERC registered Functional Entities
- Definition expanded to include grid stressors such as change related to portfolio evolution and increasing complexity

MISO

MISO is prepared for and managing threats driven by events as well as changes

Events

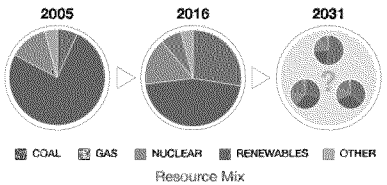


Examples include:

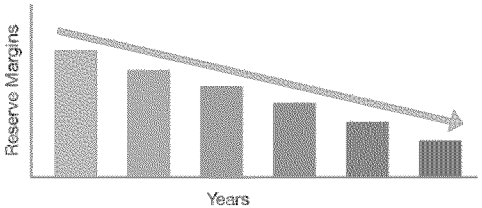
- Natural events and weather events
- Blackouts and major outages
- Cyber and physical attacks / threats
- Disruptions to related infrastructure (communications, fuel supply, transportation, water, waste-water, other)

Change

Changing resource mix



Lower reserve margins



Examples include:

- Changing baseload resources, renewables, and grid topology
- Tightened reserve margins and importance of resource availability and system flexibility
  - Scarcity now seen in shoulder seasons
  - More supply variability with increased renewables
- New resource technologies – DER, storage, etc.
- Fuel supply and delivery vulnerabilities
- Increasing complexity - higher end-to-end interaction and interdependence (generation, transmission, distribution, and consumer)

MISO

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MISO is working to improve Grid Resilience

	Technology and Security	Markets	System Planning	Operations
	Maturing identification, protection, detection and response capabilities	Operating efficient markets that incent and coordinate resilient outcomes	Enhancing planning criteria to ensure a reliable, flexible transmission system	Improving the ability to anticipate, withstand, and recover
Implemented	• Vulnerability identification • Communication resiliency evaluation • Risk-based approach appropriate to the critical nature of MISO's technology and security	• Market Roadmap for an evolving portfolio (e.g. ramp product for short-term fluctuations in energy requirements) • Improved scarcity pricing and emergency pricing • Enhancements to market-to-market and coordinated transaction scheduling	• Long-term planning for robustness across multiple future scenarios, incorporating uncertainty • Evaluating system robustness through a Renewable Integration Impact Assessment • Increasing stakeholder awareness of impact of low frequency / high impact events	• Improved situational awareness with disaster preparedness and operating guides • Improved Gas-Electric Coordination (including winterization guidelines) • Drills – cyber-attacks, control room evacuation, system failure, seasonal readiness, restoration plans, Load Modifying Resource (LMR) and Emergency Demand Response (EDR)
Planned	• Mature identification, protection, detection and response capabilities • Focus on resiliency and recovery agility • Collaborate to strengthen security and raise vigilance with our employees, members, and governmental entities • Industry event participation (Grid-EX IV)	• Market System Enhancement - Developing architectural standards with innate resilience • Market Roadmap – Multiday Unit Commitment, Combined Cycle Modeling, Short-term Capacity Reserves, Stored Energy	• Defining planning resiliency metrics and their associated values based upon impact analysis and stakeholder input • Enhanced planning to address reliable portfolio evolution • Enhanced planning to incorporate resiliency metrics	• Implement alternatives for balancing during extended outages • Resource Availability and Need (including Fuel Assurance) • Stakeholder training simulator expansion for extreme events (Loss of multiple units, islanding) • Advances in parallel flow visualization

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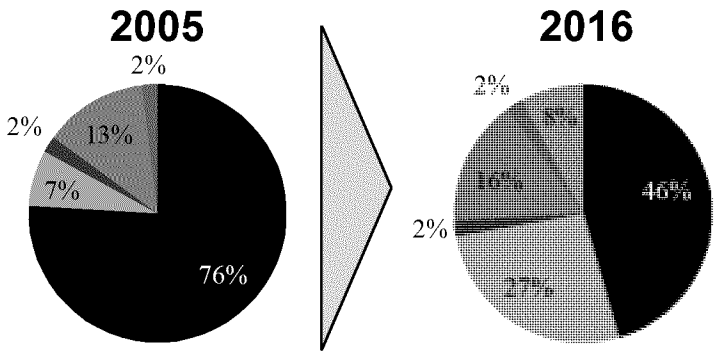
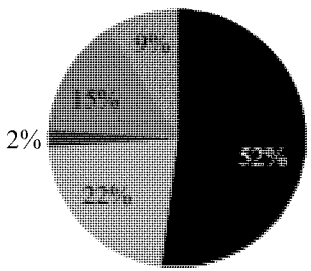
MISO's generation portfolio changed significantly in the past decade, and MISO is planning for several different future scenarios

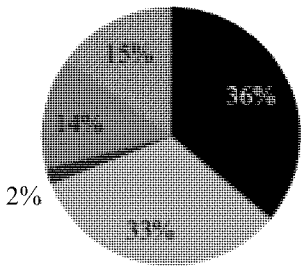
MISO Generation Portfolio Evolution

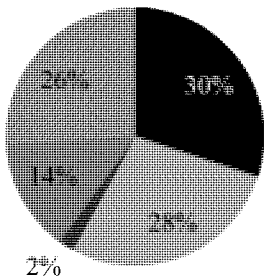


COAL
GAS
HYDRO
NUCLEAR
OTHER
RENEWABLES

2031 Future Scenarios







Existing Fleet
No carbon regulations modeled but some reductions expected due to RPS and economics.

Policy Regulation
Carbon regulations targeting a 25% reduction across all aggregated unit outputs are enacted.

Accelerated Technology
Increase in carbon emissions results in carbon regulations targeting a 35% reduction across all aggregated unit outputs to be enacted.

MISO

MISO's markets changed alongside the generation portfolio to incentivize units capable of supporting resilience and reliability in diverse ways

Ramp Product May 2016	• Provides transparent price signals to help manage ramp constraints that could lead to short-term reserve scarcity events
Extended Locational Marginal Pricing Phase II May 2017	• Expands the criteria of online fast-start resources from 100 minutes start-up/notification to 60 minutes
Scarcity Pricing	• Signals market that MISO is anticipating shortage while procuring the product at an administratively determined price
Emergency Pricing Phase II Jul 2017	• Off-line fast start resources amortized over minimum run time • Available Maximum Emergency units allowed to move down below their Economic Minimum limits

MISO

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MISO continues to work with stakeholders to develop market enhancements that properly value both new and legacy resources

Market System Enhancement

- The Market System Enhancement program will develop and implement the necessary strategic investments in our market systems to allow us to meet the evolving needs of our customers in the future.

Multiday Unit Commitment

- This project will explore potential improvements in economic scheduling over a longer time horizon than MISO's current Day-Ahead Market.

Combined Cycle Modeling

- This project provides a mechanism to allow combined cycle generator to offer in more than one unit configuration, along with associated costs, on an hourly basis—allowing for the hourly selection of the most economical configuration.

Short-Term Capacity Reserves

- This project explores options that ensure short-term capacity availability to address local and system-wide requirements.

Stored Energy

- Multiple Market Road Map projects would address storage aggregation, and new storage resources.

MISO

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Conclusion

- MISO's markets achieve economic efficiency, while supporting reliable operations
- MISO is accelerating planned market efforts to improve resilience and address resource portfolio evolution
- Current and planned market enhancements position MISO to continue to support reliable, resilient operations

Questions?

To: Baptist, Erik[baptist.erik@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]; Schwab, Justin[schwab.justin@epa.gov]
Cc: Schmidt, Lorie[Schmidt.Lorie@epa.gov]; Kataoka, Mark[Kataoka.Mark@epa.gov];
Personal Email/Ex. 6
From: Hengst, Benjamin
Sent: Tue 8/15/2017 2:02:14 PM
Subject: FW: Glider response letter (revised draft), plus some other materials
HD gliders intent to revisit 8.15.17.docx
Fitzgerald et al petition for reconsideration of EPA's glider kit regula....pdf
Heavy-duty Phase 2 NPRM and FRM discussion of EPA authority to regulate ....pdf

Resending with corrected email for Lee Cook, Acting Office Director for OTAQ this week. Ben

Subject: Glider response letter (revised draft), plus some other materials

Hi folks—attached is an updated draft glider response letter for your review.

Please note that OGC career staff have not reviewed the draft letter yet (Mark was out; David is out). I'm copying Mark (who returns to the office today) and Lorie here so they have a chance to look at this as well.

During our briefing last Friday there were a number of questions and discussions regarding what

Deliberative Process Privilege/Ex. 5

engines. In addition to the draft letter, we have also attached 2 items related to those topics to supplement last Friday's briefing material. We thought this might be helpful for reference.

- The July 10 petition for reconsideration from Fitzgerald Glider Kits, Harrison Truck Centers, and Indiana Phoenix

- The heavy-duty Phase 2 rulemaking NPRM and FRM preamble discussion of the Clean Air Act authority for new vehicles and rebuilt heavy-duty engines and how the statute relates to EPA's proposed and final actions.

We'll move this letter once review has concluded. Thanks, Ben

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OFFICE OF THE
EXECUTIVE SECRETARIAT

July 10, 2017

Scott Pruitt, Administrator
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Re: Petition for Reconsideration of Application of the Final Rule Entitled "Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2 Final Rule" to Gliders

Pursuant to 5 U.S.C. § 553(e) and 42 U.S.C. § 7607(d)(7)(B), Fitzgerald Glider Kits, LLC ("Fitzgerald"), Harrison Truck Centers, Inc. ("Harrison"), and Indiana Phoenix, Inc. ("Indiana Phoenix") (collectively, "Petitioners"), on behalf of the glider industry, hereby request that the Environmental Protection Agency ("EPA") reconsider the application of the final rule entitled "Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2 Final Rule," 81 Fed. Reg. 73,478 (Oct. 25, 2016) ("Phase 2 Rule"), to "gliders."[1]

Background

"Gliders" are medium- and heavy-duty trucks that are assembled by combining certain new truck parts (that together constitute a "glider kit") with the refurbished powertrain—the engine, the transmission, and typically the rear axle—of an older truck. The glider kit generally includes the tractor chassis with frame, front axle, cab, and brakes. 81 Fed. Reg. at 73,512. A glider is manufactured by combining the powertrain from the used vehicle with the parts in the glider kit.

Gliders are approximately 25% less expensive than new trucks, a significant cost savings for small businesses and owner-operators. Envtl. Prot. Agency & Dep't of Transp., Response to Comments for Joint Rulemaking ("RTC"), at 1846 (Aug. 2016) (comment of GATR Truck Center). Businesses and drivers that cannot afford a new truck often purchase gliders as an alternative to continuing to drive their older vehicle. *Id.* at 1825 (comment of Clarke Power Services). Glider kits can also extend the working life of a damaged vehicle. *Id.* Gliders also require less maintenance, yielding less downtime, and have modern safety features and amenities. *Id.* Overall, they offer a more economical option for smaller fleets and owner-operators to maintain the reliability of their commercial trucking operations.

In the Phase 2 Rule published October 25, 2016, EPA for the first time mandated that glider kits, glider vehicles, and rebuilt engines installed in gliders (hereinafter "gliders") satisfy

[1] The Phase 2 Rule was jointly promulgated by EPA and the National Highway Traffic Safety Administration ("NHTSA"), an agency within the Department of Transportation ("DOT"). Because Petitioners request reconsideration of only certain elements of the Phase 2 Rule that were promulgated pursuant to EPA's Clean Air Act authority, this Petition is directed to EPA, and not NHTSA or DOT.

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emissions standards applicable to new motor vehicles and new motor vehicle engines. The regulations accomplish this by ignoring the age of the engine and other powertrain elements installed in gliders and applying instead emissions standards based on the "calendar year in which assembly of the glider is completed." 81 Fed. Reg. at 73,943; *see* 40 C.F.R. § 1037.635. In other words, if a glider assembler installs a reclaimed engine in a glider in 2017, that engine must be certified to comply with all emissions standards applicable to new engines from model year 2017, regardless of the actual model year of the engine. "This requirement applies to all pollutants, and thus encompasses criteria pollutant standards as well as the separate [greenhouse gas ("GHG")] standards." 81 Fed. Reg. at 73,943; *see* 40 C.F.R. § 1037.635.

Recognizing that the new standards applied to gliders in the Phase 2 Rule were both sudden and onerous, the Phase 2 Rule purports to provide some "transitional flexibilities," 81 Fed. Reg. at 73,942, but these provisions are not enough to prevent a devastating impact on the glider industry when the standards become almost fully applicable to gliders on January 1, 2018. In 2017, glider assemblers are permitted to produce a limited number of gliders exempt from the regulations. The number of gliders exempted in 2017 for any particular company is equivalent to the "highest annual production of glider kits and glider vehicles for any year from 2010 to 2014" by the company. 40 C.F.R. § 1037.150(t)(3). Because of the growth of their business since 2014, this provision has forced Fitzgerald, Harrison, and Indiana Phoenix to scale back production in 2017 to a certain degree, but it has allowed for continued operation. Beginning January 1, 2018, however, the 2017 regime is replaced with an allowance to build only 300 gliders per year that are exempt from the regulations. *Id.* § 1037.105(t)(1)(ii). This stringent production cap would effectively destroy the glider industry.[2]

Despite EPA's stated goal to reduce greenhouse gas emissions, EPA did not perform any actual testing to analyze the environmental impact of remanufactured engines and gliders compared to new Original Equipment Manufacturer ("OEM") vehicles. Instead, it relied on unsubstantiated assumptions about the number of older engines used in gliders and the emissions from engines used in gliders.

If left in place, the Phase 2 Rule would significantly curtail American manufacturing and effectively shut down the glider industry and the nearly 20,000 jobs it supports across the nation. For example, Fitzgerald, which is based out of Tennessee and Kentucky, is currently responsible for 1,600 direct and indirect jobs in those two states alone and several thousand more associated with suppliers across the country. Yet, if this regulation goes into full effect, by the end of the year, the company will be forced to cut production and its workforce by 90%. Harrison, based in Iowa, employs approximately 450 people, and its suppliers account for many more glider-related jobs. Indiana Phoenix, based in Indiana, directly employs over a 100 people in Avilla, Indiana. The Phase 2 Rule, if it takes effect, would put more job opportunities out of reach for economically challenged areas already struggling with unemployment. Additionally, it would force small businesses to buy more expensive new vehicles instead of growing their business and creating jobs.

[2] There are additional exceptions from the general requirement for engines from more recent model years or with relatively few miles of engine operation. *See* 40 C.F.R. §§ 1037.150(t)(2); 1037.635(c). These carve outs do not apply to the vast majority of the gliders assembled by companies like Fitzgerald and Harrison, which tend to use engines from earlier model years and that have been subjected to normal use.

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Bases for Reconsideration

EPA should reconsider the application of the Phase 2 Rule to glider kits, glider vehicles, and rebuilt engines installed in gliders for three reasons: (1) Section 202(a) of the Clean Air Act does not authorize EPA to regulate gliders; (2) EPA's prior decision to regulate gliders was based on unsupported assumptions rather than data; and (3) reconsideration is warranted under Executive Order 13783.

1. Section 202(a) of the Clean Air Act Does Not Authorize EPA to Regulate Gliders

The Phase 2 Rule relied on EPA's authority under section 202(a) of the Clean Air Act to regulate emissions from "new motor vehicles" and "new motor vehicle engines." 42 U.S.C. § 7521(a)(1). Because glider vehicles are not "new motor vehicles" and glider engines are not "new motor vehicle engines," EPA lacked authority under this provision to apply the Phase 2 Rule to gliders.

A glider is not a "new motor vehicle" because the most significant parts of the vehicle—the engine, transmission, and typically the rear axle—are not new. A vehicle is a "new motor vehicle" within the meaning of the Clean Air Act only if "equitable or legal title" to the vehicle has "never been transferred to an ultimate purchaser." 42 U.S.C. § 7550(3). For gliders, the "legal or equitable" title to the main components of the vehicle had previously "been transferred to an ultimate purchaser"—the owner of the donor truck. Simply adding new parts to a used truck does not make it a "new motor vehicle." The Phase 2 Rule's consideration of this issue was arbitrary and capricious and contrary to law. The Rule indicated first that EPA's authority could not be challenged because EPA had implicitly found gliders to be new vehicles in its Phase 1 Rule, which granted an interim exemption for gliders. 81 Fed. Reg. at 73,513-14. EPA, however, had an obligation to determine in the Phase 2 Rule that it had authority to act. *See Louisiana Pub. Serv. Comm'n v. FCC*, 476 U.S. 355, 374 (1986) ("[A]n agency literally has no power to act . . . unless and until Congress confers power upon it."); *Arlington v. FCC*, 133 S. Ct. 1863, 1880 (2013) (same). The Phase 2 Rule also erroneously based its interpretation of the Clean Air Act on marketing materials from the Fitzgerald web site. 81 Fed. Reg. at 73,514. EPA's legal authority does not turn on how a glider is described in marketing materials. EPA should reconsider this issue and conclude that because the principal parts of a glider are used, a glider is not a "new motor vehicle."

Such a conclusion would be consistent with the treatment of this issue by the National Highway Traffic Safety Administration ("NHTSA"). NHTSA's regulations make clear that a truck is not considered to be "newly manufactured" if the "engine, transmission, and drive axle(s) (as a minimum) of [an] assembled vehicle are not new" and at least two of those three components come from the same donor vehicle. 49 C.F.R. § 571.7(e). Gliders do not fall within this definition. EPA failed adequately to explain its departure from NHTSA's approach.

Moreover, "glider kits" do not even fall within the Clean Air Act's definition of "motor vehicle." Under the Act, a "motor vehicle" must be "self-propelled." 42 U.S.C. § 7550(2). But a glider kit lacks an engine, transmission, and often a rear axle. A collection of parts lacking these key components obviously is not "self-propelled." The Phase 2 Rule relies on particular

provisions authorizing regulation of specific vehicle components. 81 Fed. Reg. at 73,514; *see* 42 U.S.C. § 7521(a)(5)(A) (fueling systems); *id.* § 7521(a)(6) (onboard vapor recovery systems). But there is no provision authorizing regulation of the parts that make up a glider kit. The fact that the Clean Air Act allows EPA to regulate certain specified vehicle components, but not the components in a glider kit, undermines the Phase 2 Rule's application to glider kits. Congress understood how to grant EPA authority to regulate vehicle components but declined to authorize regulation of glider kits. *See TRW, Inc. v. Andrews*, 534 U.S. 19, 28-29 (2001) (applying *expressio unius* canon of construction). Under the interpretation set forth in the Phase 2 Rule, there would be no limit on EPA's authority to regulate parts of vehicles.

The Phase 2 Rule also states that EPA has authority to regulate "incomplete vehicles" and "vehicle components" under Section 202(a). *See* 81 Fed. Reg. at 73,514. It first points to language from Section 202(a)(1) stating that EPA has authority "whether such [new motor] vehicles . . . are designed as complete systems or incorporate devices to prevent or control . . . pollution." 42 U.S.C. § 7521(a)(1). This portion of section 202(a)(1), however, merely provides that emissions standards are limited to the useful life of a vehicle or engine. *See id.* It does not purport to expand EPA's authority in the first sentence of that section. *See id.* ("The Administrator shall by regulation prescribe (and from time to time revise) in accordance with the provisions of this section, standards applicable to the emission of any air pollutant from any class or classes of *new motor vehicles* . . . ." (emphasis added)).[3]

Finally, the Phase 2 Rule erred in concluding that glider engines are "new motor vehicle engines" under the Act. A "new motor vehicle engine" is defined as either (1) "an engine in a new motor vehicle," or (2) a "motor vehicle engine the equitable or legal title to which has never been transferred to the ultimate purchaser." 42 U.S.C. § 7550(3). Because a glider is not a new motor vehicle, a glider engine is not "an engine in a new motor vehicle." *Id.* And because a glider engine has previously been owned, title in the engine has previously been "transferred to an ultimate purchaser." *Id.*

For all of these reasons, Petitioners respectfully suggest that EPA reconsider its authority to regulate gliders under Section 202(a) of the Clean Air Act.

2. EPA's Prior Decision To Regulate Gliders Was Based on Unsupported Assumptions Rather than Data

The Phase 2 Rule relied upon unsupported assumptions to arrive at the conclusion that immediate regulation of glider vehicles was warranted and necessary. First, the Phase 2 Rule assumed that *all* glider engines would be older engines from before 2002. *See* 81 Fed. Reg. at

[3] The Phase 2 Rule also indicated that EPA's authority to regulate "defeat devices" "support[ed] the actions EPA is taking [under section 202] with respect to . . . glider kits." 81 Fed. Reg. at 73,518. There is no basis for this contention. Under the Act, a defeat device is "any part or component intended for use with, or as part of, any motor vehicle or motor vehicle engine, where a principal effect of the part or component is *to bypass, defeat, or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine* in compliance with [Clean Air Act] regulations." 42 U.S.C. § 7522(a)(3)(B) (emphasis added). But the "principal effect" of a glider kit is not to "bypass, defeat, or render inoperative" some "device" or "element of design" in a vehicle. The Rule never explained what device or element of design it thought was being defeated.

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73,943 ("The modeling also assumed that these gliders emit at the level equivalent to the engines meeting the MY 1998-2001 standards . . . ."); RTC 1960-1961. EPA indicated that it believed "*most* glider vehicles currently being produced use remanufactured engines of this vintage," *id.* (emphasis added), but it made no effort to quantify what percentage of glider engines in fact would fall within this category and instead assumed that *all* of them would. In fact, the model year of the engines used in glider vehicles varies depending on the donor vehicle or owner and includes engines from after 2002.

EPA also assumed that the nitrogen oxide ("NO_x") and particulate matter ("PM") emissions of glider vehicles using pre-2007 engines would be at least ten times higher than emissions from equivalent vehicles being produced with brand new engines. *See id.* at 73,942. But EPA relied on no actual data to support this conclusion; it simply relied on the pre-2007 standards. *Id.* A recent study by Tennessee Technological University ("Tennessee Tech") analyzing the NO_x, PM, and carbon monoxide ("CO") emissions from both remanufactured and OEM engines reached a contrary conclusion. *See* Exhibit 1 (Letter to the Hon. Diane Black from Philip B. Oldham, President, Tennessee Technological University, and Thomas Brewer, Associate Vice President, Center for Intelligent Mobility (June 15, 2017)). The results showed that remanufactured engines from model years between 2002 and 2007 performed roughly on par with OEM "certified" engines, and in some instances even out-performed the OEM engines. *See id.* at 1. Tennessee Tech's research also "showed that remanufactured and OEM engines experience parallel decline in emissions efficiency with increased mileage." *Id.* at 2. Tennessee Tech also estimated that glider vehicles would emit less than 12% of the total NO_x and PM emissions for all Class 8 heavy duty vehicles, *see id.*, not 33% as the Phase 2 Rule suggests, *see* 81 Fed. Reg. at 73,943. Tennessee Tech's findings constitute new information, developed since the Phase 2 Rule was promulgated, and provide a basis for EPA to reconsider the existing rule pursuant to Section 307 of the Clean Air Act. 42 U.S.C. § 7607(d)(7)(B); *see* S. Rep. No. 91-1196, at 41-42 (1970) ("[N]ew information . . . may dictate a revision or modification of any promulgated standard or regulation established under the [Clean Air] act."); *Oljato Chapter of the Navajo Tribe v. Train*, 515 F.2d 654, 660 (D.C. Cir. 1975) (same).

EPA also did not account for its own low-sulfur diesel rule. Starting in 2006, EPA required that diesel fuel refiners produce diesel fuels with a 97% lower sulfur content. *See* 40 C.F.R. §§ 80.500, 80.520. This reduction of sulfur significantly reduced the amount of NO_x, PM, and other pollutants emitted from diesel engines, including gliders and other heavy-duty truck tractors. This reduction was not taken into account in the development of the Phase 2 Rule for gliders.

The Phase 2 Rule also erroneously assumed that the only explanation for the growth of the glider vehicle market was that glider assemblers sought to avoid the increasingly restrictive emission standards for engines in new OEM tractors. 81 Fed. Reg. at 73,943. The reality is that glider vehicles do not directly compete with new OEM tractors. For most individuals or companies that purchase gliders, the choice is not between a glider or a new tractor. The choice is between a glider and continuing to run their old tractor. Further, glider vehicle assemblers often take the lead on forward-thinking research and development that benefits the entire industry, including innovative research on fuel additives, emission devices, and tire and wheel combinations in small production runs. *See* Exhibit 1, at 2. Glider assemblers are currently

testing components, light weight drive systems, alternative fuel mixtures, autonomous drive systems, light weight body materials, and intelligent transportation systems. *Id.* In short, the glider assemblers are a complementary part of the medium- and heavy-duty truck industry, not direct competitors to OEMs.

Finally, the Phase 2 Rule failed to consider the significant environmental *benefits* that glider vehicles create. Glider vehicle GHG emissions are less than those of OEM vehicles due to gliders' greater fuel efficiency, and the carbon footprint of gliders is further reduced by the savings created by recycling materials. Gliders are 20% more fuel efficient than OEM vehicles. *See id.* Moreover, gliders reuse engines and other components, instead of casting new parts. Glider assemblers reuse approximately 4,000 pounds of cast steel in the remanufacturing process, including 3,000 pounds for the engine assembly alone. *Id.* Reusing these components avoids the environmental impact of casting steel, including the significant associated NO_x emissions. *See, e.g.*, National Emission Standards for Hazardous Air Pollutants: Integrated Iron and Steel Manufacturing, 68 Fed. Reg. 27,646 (May 20, 2003); Envtl. Prot. Agency, *Alternative Control Techniques Document – NO_x Emissions From Iron and Steel Mills*, EPA-453/R-94-065 (Sept. 1994); *see also* Exhibit 1, at 2. Given their better fuel efficiency and reuse of cast steel, gliders have a lower carbon footprint than OEM vehicles, a fact not considered in the development of the Phase 2 Rule.

In light of the new information developed by Tennessee Tech and the unsupported assumptions that form the basis for the Phase 2 Rule as it applies to gliders, EPA should reconsider the rule.

3. Reconsideration Is Warranted under Executive Order 13783

The March 28, 2017 Executive Order, "Presidential Executive Order on Promoting Energy Independence and Economic Growth," further highlights why EPA should reconsider the Phase 2 Rule as it applies to gliders. Exec. Order No. 13,783 (Mar. 28, 2017). The Executive Order rescinds (among other things) the June 2013 report from the Executive Office of the President, titled "The President's Climate Action Plan," and instructs EPA and all other federal agencies to "identify existing agency actions related to or arising from" the now-rescinded plan and to "suspend, revise, or rescind, or publish for notice and comment proposed rules suspending, revising, or rescinding any such actions, as appropriate and consistent with law and with the policies set forth in section 1 of th[e] order." *Id.* §§ 3(b), (d). The Phase 2 Rule is a direct product of the Climate Action Plan. 81 Fed. Reg. at 73,480. And reconsideration of the application of the Phase 2 Rule to gliders is consistent with the Executive Order's stated purpose of avoiding environmental regulation that "constrain[s] economic growth" and "prevent[s] job creation" and ensuring that "environmental regulations comply with the law, are of greater benefit than cost, and are developed through transparent processes that employ the best available peer-reviewed science and economics." Exec. Order No. 13,783 §§ 1(a), (e). Because the Phase 2 Rule is related to the rescinded Climate Action Plan, and because the portion of the Rule that applies to gliders conflicts with the policies set forth in Section 1 of the Order, EPA should reconsider the rule. Based on that reconsideration, EPA should "suspend, revise, or rescind" the Rule as applied to gliders, including, as necessary, by promulgating new regulations. *See id.* § 3(d).

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Conclusion

For the foregoing reasons, Petitioners respectfully request EPA to reconsider application of the Phase 2 Rule to gliders. Given the impending January 1, 2018 compliance date, which will effectively eliminate the industry, Petitioners request that EPA complete this reconsideration as soon as possible.

Respectfully,

Fitzgerald Glider Kits, LLC
Tommy C. Fitzgerald, President

Harrison Truck Centers, Inc.
Dustin Petersen, Shareholder

Indiana Phoenix, Inc.
Dane Keener, General Manager

ED_001523_00006502-00007

EXHIBIT 1

Office of the President

TENNESSEE TECH

June 15, 2017

The Honorable Diane Black
1131 Longworth HOB
Washington, DC 20515

Reference: Tennessee Tech University – Summary of Heavy Duty Truck Study and Evaluation of the Phase II Heavy Duty Truck Rule

Congressman Black:

From September 2016 – November 2016, the Tennessee Technological University Department of Civil and Environmental Engineering ("Tennessee Tech") conducted the first phase of its research on the environmental and economic impact of the Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles – Phase 2 rule ("Phase 2 Rule") published October 25, 2016. The key areas of research were to (1) Compare Glider Kit compliance with the Phase 2 Rule; (2) Perform high level environmental footprint and economic study of OEM manufacturing vs. assembly of remanufactured components (Glider Kits); and (3) Evaluate industry optimization plans to address future environmental regulations including but not limited to production vehicles, component assembly, and facility compliance.

To carry out the environmental footprint component of the research, Tennessee Tech tested thirteen heavy-duty trucks on a common chassis dynamometer at a common site; eight trucks were remanufactured engines and five were OEM "certified" engines, all with low mileage (NOTE: These Base Line Setting Phase I results were completed by testing only one Glider Kit manufacturer's product and one OEM's product). Each vehicle was evaluated for fuel efficiency, carbon monoxide (CO), particulate matter (PM) emissions and nitrogen oxide (NO_x). The results of the emissions test were compared with the 2010 EPA emissions standards for HDVs. Our research showed that optimized and remanufactured 2002-2007 engines and OEM "certified" engines performed equally as well and in some instances out-performed the OEM engines. (see also Appendix A for more detailed test results).

Summary Chart of Phase 1 Test Results	
Emission Standard	**Result**
CO	All vehicles met the standard
PM	All vehicles met the standard
NO_x	None of the vehicles met the standard

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While none of the vehicles met the NO_x standard, a glider remanufactured engine achieved the best result of any engine tested (see Appendix A). Further, our research showed that remanufactured and OEM engines experience parallel decline in emissions efficiency with increased mileage. Contrary to the assertion in the Phase 2 Rule, it is our estimate that the glider kit HDVs would emit less than 12% of the total NO_x and PM emissions, not 50%, for all Class 8 HDVs. Should the Phase 2 glider cap be fully implemented on January 1, 2018, there is little doubt that consumers utilizing glider vehicles, due to economic considerations, will delay purchasing new equipment and consequently, slow the reduction of engine emissions nationwide. In this regard, the Phase 2 rule is counter-productive to its stated intent.

In addition to equal or lower emissions, glider kits have a smaller carbon footprint than OEM vehicles due to fuel efficiency and recycling of materials. Comparisons between 2016 glider kit vehicles and new EPA compliant vehicles for fuel efficiency reflect that glider kits are 20% more efficient on fuel consumption. Glider vehicles also reuse engines and other components in the remanufacturing process, resulting in the reuse of approximately 4,000 pounds of cast steel. The engine assembly alone accounts for approximately 3,000 pounds of recycled cast steel. Thus, the well-documented environmental impact of casting steel, including the significant NOx emissions, is avoided by reusing cast steel components in glider vehicles. Consequently, given the superior fuel efficiency and the reuse of cast steel, glider vehicles have a lower carbon footprint than OEMs. None of these facts were considered in the development of the Phase 2 rule.

From an economic standpoint, Tennessee Tech examined the impact of the Phase 2 Rule sales cap of 300 units for glider kits would have on the State of Tennessee. The 300 unit sales cap represents 9% of Fitzgerald's current sales. It is estimated that a 91% reduction in output by Fitzgerald would result in a direct loss of approximately 947 jobs and a loss of approximately $512 million of economic output in the State of Tennessee alone. This impact takes into account the direct and indirect economic impact, including expenditures on labor, operations and maintenance as well as changes in the supply chain throughout the state. Additionally, on a broader scale, the economic impact of the Phase 2 Rule could easily exceed $1 billion nationwide due to thousands of permanent job losses and supply chain interruption and reduction. The Phase 2 Rule failed to sufficiently evaluate and consider these impacts.

Finally, this phase of the research shows that trucking companies that utilize glider kit HDVs in their fleets are vigilant in maintenance and elect to optimize their fleets to maximum efficiency throughout the life span of the vehicle. Further, glider kit assemblers facilitate research and development for OEM's by conducting innovative research for fuel additives, emission devices, tire and wheel combinations in small production runs and are currently testing components, light weight drive systems, alternative fuel mixtures, autonomous drive systems, light weight body materials, and intelligent transportation systems. As a general statement, our observation is glider assemblers are in tune with industry needs and cutting edge innovation.

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Tennessee Tech will continue to evaluate HDV engines during Phase II of the research in 2017. Such effort will be conducted in conjunction with the Oak Ridge National Lab - Fuel Engines & Emissions Research Center. The goals of the next phase include development of engineering and manufacturing solutions that exceed EPA emission standards, a focused research, development, and testing plan for NO_x emissions, and to continue testing to demonstrate continuous improvement of emissions from remanufactured heavy-duty engines.

Sincerely,

Philip B. Oldham
President

Thomas Brewer
Associate Vice President
Center for Intelligent Mobility

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APPENDIX A: Testing Results from Tennessee Tech Phase 1 Heavy Duty Vehicle Study			
Engine	**Type**	**CO (g/HP * hr)** **(2010 standard = 15.5)**	**PM**
Detroit Diesel DD15	ReMan	0.290	BTD
Caterpillar CT13	ReMan	0.212	BTD
Detroit Diesel Series 60	ReMan	1.553	BTD
Detroit Diesel Series 60	ReMan	1.959	BTD
Detroit Diesel Series 60	ReMan	0.015	BTD
Detroit Diesel Series 60	ReMan	0.317	BTD
Detroit Diesel Series 60	ReMan	0.483	BTD
Detroit Diesel Series 60	ReMan	0.467	BTD
Detroit Diesel DD15	OEM	0.491	BTD
Detroit Diesel DD15	OEM	1.169	BTD
Detroit Diesel DD15	OEM	0.556	BTD
Detroit Diesel DD15	OEM	0.098	BTD
Detroit Diesel DD15	OEM	1.558	BTD

*BTD=below threshold detection point

** NO_x (g/HP * HP) (2010 standard = 0.2); All tested engines were higher than the standard and ranged from a low of 0.44 to a high of 6.45. The lowest tested NOx was a Fitzgerald – Reman Detroit Diesel DD 15 using proprietary Fitzgerald engine design and set up. That same engine also tested at the 0.290 Co rate.

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Package Details:

- Washington Express tracking number: 2589830
- Package Sent To:

  Cheryl Woodward
  Environmental Protection Agency
  1200 Pennsylvania Avenue, N.W.
  North Building
  Washington, DC 20004
  US

- Client/Matter/Sender: 2214062/00120/02092
- Ready Time: 03:15 PM
- Service: Regular
- Packaging: Env-Package-Book
- Pieces: 1
- Weight: unspecified
- Instructions: Please wait at security till 4:30pm and Cheryl Woodward will meet you there at exactly 4:30pm to except the envelope.

NPRM discussion of EPA authority to regulate glider vehicles

80 FR 40529-30

(July 13, 2015)

hundred each year to thousands.[880] While the few hundred glider vehicles produced annually in the 2004–2006 timeframe may have been produced for arguably legitimate purposes such as salvaging powertrains from vehicles otherwise destroyed in accidents, EPA believes the tenfold increase in glider kit production since the MY 2007 criteria pollutant emission standards took effect reflects an attempt to circumvent these more stringent standards and (ultimately) the Clean Air Act.

The cost for manufacturers to comply with the vehicle-based GHG standards is similar for gliders as for other new vehicles. Similar to EPA's analysis of emissions above, although we cannot precisely quantify the cost of complying with the proposed engine requirements for criteria pollutant standards because it is dependent on which engines would be used and which would have otherwise been used, EPA nevertheless believes that cost-effectiveness (dollars per ton) of the proposed requirement relative to any pre-2007 engine would be similar to the cost-effectiveness of the NO_X and PM standards for current model year engines, which EPA has already found to be cost effective.

The agencies (as well as the broader SBAR Panel) are, however, concerned about adverse economic impacts on small businesses that assemble gliders and build glider kits, and we recognize that production of a smaller number of gliders by these small manufacturers may be appropriate for salvaged engines or other non-circumvention purposes. Therefore, EPA is proposing a new provision that would preserve its regulatory status quo for existing small businesses, but cap annual production based on recent sales. Thus, a limited number of glider kits produced by small businesses would not have to meet the GHG vehicle standards, and could use rebuilt or used engines provided those engines were certified to the year of the engine's manufacture. For example, an existing small business that produced between 100 and 200 glider vehicles per year would be allowed to produce up to 200 glider vehicles per year under without having to certify them to the GHG standards, or re-certifying the engines to the now-applicable EPA standards for criteria pollutants and GHGs (so long as the engine is certified to criteria pollutant standards for the year of its manufacture). To be eligible for this provision, EPA is also proposing that no small entity could produce more than 300 glider vehicles in any given model year without certifying (or recertifying) to any EPA standards. EPA believes that this level reflects the upper end of the range of production that occurred before significant circumvention of the 2007 criteria pollutant standards began. We request comment on the appropriate caps (including the appropriate magnitude of the caps) and on whether any other special provisions would be needed to accommodate glider kits. EPA also requests comment on whether we should allow larger manufacturers to produce some limited number of glider kits.

(4) Lead Time for Amended Standards

EPA is proposing that this requirement for gliders to meet engine and vehicle standards applicable to other new vehicles and engines take effect on January 1, 2018. EPA believes this provides sufficient time to "permit the development and application of the requisite control measures" (CAA section 202 (a)(3)(D)) because compliant engines are available today, although manufacturers would need several months to change business practices to comply. EPA also solicits comment on whether an earlier or later compliance date would be appropriate. We also request comment on whether we should include a production limit if we provide additional lead time in the Final Rule.

(5) Legal Authority and Definitions Under the Clean Air Act

With respect to statutory authority under the Clean Air Act, EPA notes first that it has broad authority to control all pollutant emissions from "any" rebuilt heavy duty engines (including engines beyond their statutory useful life). See CAA section 202(a)(3)(D). EPA is to give "appropriate" consideration to issues of cost, energy, and safety in developing such standards, and to provide necessary lead time to implement those standards. As noted above, if a used engine is placed in a glider kit, the engine would be considered a "new motor vehicle engine" because it is being used in a new motor vehicle (as explained in the following paragraph). See CAA section 216(3). With respect to the vehicle-based GHG standards, there is no question that the completed glider is a "motor vehicle" under the Clean Air Act (as well as under NHTSA's safety provisions). Some in the trucking industry have questioned whether a glider kit (without an engine) is a motor vehicle. However, EPA considers glider kits to be incomplete motor vehicles, and EPA has the authority to regulate incomplete motor vehicles, including unmotorized chassis.

Under the CAA, it is also important that "new" is determined based on legal title and does not consider prior use. Thus, glider kits that have a new vehicle identification number (VIN) and new title are considered to be "new motor vehicles" even if they incorporate previously used components. Note that under the Clean Air Act, EPA would not consider the fact that a vehicle retained the VIN of the donor vehicle from which the engine was obtained determinative of whether or not the vehicle is new.

The CAA also defines "manufacturer" to include any person who assembles new motor vehicles. EPA is proposing to revise its regulatory definitions of these terms in 40 CFR 1036.801 and 1037.801 to more clearly reflect these aspects of the CAA definitions—that glider kits are "new motor vehicles", previously used engines (whether rebuilt or not) installed into glider kits are "new motor vehicle engines", and any person who completes assembly of a glider is a "manufacturer". EPA also notes that under the existing 40 CFR 1037.620, glider kit assemblers would generally be considered to be secondary vehicle manufacturers. That section, which EPA is proposing to redesignate as 40 CFR 1037.622, allows secondary vehicle manufacturers that have a valid certificate or exemption to receive incomplete vehicles (such as glider kits) from OEMs.

To further clarify that EPA considers both glider kits and completed glider vehicles to be motor vehicles, EPA is proposing to add a clarification to our definition of "motor vehicle" in 40 CFR 85.1703 regarding vehicles such as gliders that clearly are intended for use on highways, consistent with the CAA definition of "motor vehicle" in CAA section 216 (2). The regulatory definition presently contains a provision stating that vehicles lacking certain safety features required by state or federal law are not "motor vehicles". This caveat needs a proper context: Is the safety feature one that would prevent operation on highways. If not, absence of that feature does not result in the vehicle being other than a motor vehicle. The proposed amendment would consequently make clear that vehicles that are clearly intended for operation on highways are motor vehicles, even if they do not have every safety feature. (EPA is also considering whether to simply eliminate the clause "or safety features required by state and/or federal law" from the regulatory definition.) This clarifying provision would take effect upon promulgation.

[880] "Industry Characterization of Heavy Duty Glider Kits", MacKay & Company, September 30, 2013.

We note that NHTSA and EPA have separate definitions for motor vehicles under their separate statutory authorities. As such, EPA's determination of how its statute and regulations apply to glider kits and glider vehicles has no bearing on how NHTSA may apply its safety authority with regard to them. See Section XIV. B. (6) for additional discussion of NHTSA's consideration of glider vehicles.

(6) Relation to NHTSA Fuel Efficiency Program and Safety Regulations

NHTSA does not consider glider kits to be motor vehicles, but it does consider assembled glider vehicles to be motor vehicles. As stated above, NHTSA is considering including glider vehicles under its Phase 2 standards. NHTSA seeks comments from glider manufacturers on this consideration.

We believe that the agencies potentially having different policies for glider kits and glider vehicles under the Phase 2 program would not result in problematic disharmony between the NHTSA and EPA programs, because of the small number of vehicles that would be involved. EPA believes that its proposed changes would result in the glider market returning to the pre-2007 levels, in which fewer than 1,000 glider vehicles would be produced in most years. Given that a large fraction of these vehicles would be exempted from EPA regulations because they would be produced by qualifying small businesses, they would thus, in practice, be treated the same under EPA and NHTSA regulations. Only non-exempt glider vehicles would be subject to different requirements under the NHTSA and EPA regulations. However, we believe that this is unlikely to exceed a few hundred vehicles in any year, which would be few enough not to result in any meaningful disharmony between the two agencies.

With regard to NHTSA's safety authority over gliders, the agency notes that it has become increasingly aware of potential noncompliances with its regulations applicable to gliders. NHTSA has learned of manufacturers who are creating glider vehicles that are new vehicles under 49 CFR 571.7(e), however, the manufacturers are not certifying them and obtaining a new VIN as required. NHTSA plans to pursue enforcement actions as applicable against noncompliant manufacturers. In addition to enforcement actions, NHTSA may consider amending 49 CFR 571.7(e) and related regulations as necessary. NHTSA believes manufacturers may not be using this regulation as originally intended.

C. Applying the General Compliance Provisions of 40 CFR Part 1068 to Light-Duty Vehicles, Light-Duty Trucks, Chassis-Certified Class 2B and 3 Heavy-Duty Vehicles and Highway Motorcycles

As described above, EPA is proposing to apply all the general compliance provisions of 40 CFR part 1068 to heavy-duty engines and vehicles. EPA proposes to also apply the recall provisions and the hearing procedures from 40 CFR part 1068 for highway motorcycles and for all vehicles subject to standards under 40 CFR part 86, subpart S. See the preceding section for a description of how the provisions from 40 CFR part 1068 compare to those in 40 CFR part 85 and part 86.

EPA also requests comment on applying the rest of the provisions from 40 CFR part 1068 to highway motorcycles and to all vehicles subject to standards under 40 CFR part 86, subpart S. EPA particularly requests comment on applying the defect-reporting provisions in 40 CFR 1068.501 to these vehicles. The general approach is to replace a fixed threshold of 25 defects as the basis for defect reporting with a scaled approach that would require defect reporting only after the manufacturer finds some larger number of actual emission-related defects. The regulation calls for manufacturers to monitor possible emission-related defects as evidenced by warranty claims, in-use testing, and other indicators, and to start investigating for actual defects once possible defects exceed an established threshold. The existing regulation in 40 CFR 1068.501 generally calls for investigating once possible defects exceed 5 to 10 percent of production, with a requirement to report defects if confirmed defects exceed a rate of 1 to 2 percent of production. The percentage thresholds that apply for a given engine/vehicle model decrease with increasing production volumes. This approach is similar to defect-reporting requirements that already apply in California. Manufacturers may be interested in complying with a single set of defect-reporting provisions nationwide; EPA therefore also requests comment on simply requiring manufacturers to follow the California defect-reporting scheme for their EPA-certified vehicles.

Note that EPA is proposing to amend 40 CFR 85.1701 to specify that the exemption provisions apply to heavy-duty engines subject to regulation under 40 CFR part 86, subpart A. This is intended to limit the scope of this provision so that it does not apply for Class 2b and 3 heavy-duty vehicles subject to standards under 40 CFR part 86, subpart S. This change corrects and inadvertently broad reference to heavy-duty vehicles in 40 CFR 85.1701.

D. Amendments to General Compliance Provisions in 40 CFR Part 1068

The general compliance provisions in 40 CFR part 1068 apply broadly too many different types of engines and equipment. This section describes how EPA is proposing to amend these procedures to make various corrections and adjustments.

(1) Hearing Procedures

EPA is proposing to update and consolidate its regulations related to formal and informal hearings in 40 CFR part 1068, subpart G. This will allow us to rely on a single set of regulations for all the different categories of vehicles, engines, and equipment that are subject to emission standards. EPA also made an effort to write these regulations for improved readability.

The hearing procedures specified in 40 CFR part 1068 apply to the various categories of nonroad engines and equipment (along with the other provisions of part 1068). EPA is proposing in these rules to apply these hearing procedures also to heavy-duty highway engines, light-duty motor vehicles, and highway motorcycles. EPA believes there is no reason to treat any of these sectors differently regarding hearing procedures.

EPA is proposing an introductory section that provides an overview of requesting a hearing for all cases where a person or a company objects to an adverse decision by the agency. In certain circumstances, as spelled out in the regulations, a person or a company can request a hearing before a Presiding Officer. Statutory provisions require formal hearing procedures for administrative enforcement actions seeking civil penalties. The Clean Air Act does not require a formal hearing for other agency decisions; EPA is therefore proposing to specify that informal hearing procedures apply for all such decisions.

The introductory section also adds detailed provisions describing the requirements for submitting information to the agency in a timely manner. These provisions accommodate current practices for electronic submission, distinguish between postal and courier delivery and provide separate requirements for shipments made from inside and outside the United States. The specified deadlines are generally based on the traditional approach of a

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81 FR 73512-19

(October 25, 2016)

stringent standards were feasible because many cost effective technologies exist for future vehicle designs. While the agencies agree that many cost effective technologies exist, and indeed, we reflect the potential for many of those technologies to be applied in our analysis for today's final rule, commenters who focused on the cost-effectiveness of technologies did not consistently recognize certain real-world constraints on technology implementation. Manufacturers and suppliers have limited research and development capacities, and although they have some ability to expand (by adding staff or building new facilities), the process of developing and applying new technologies is inherently constrained by time. Adequate lead time is also necessary to complete durability, reliability, and safety testing and ramp up production to levels that might be necessary to meet future standards. If the agencies fail to account for lead time needs in determining the stringency of the standards, we could create unintended consequences, such as technologies that are applied before they are ready and lead to maintenance and repair problems. In addition to cost-effectiveness, then, lead time constraints can also be highly relevant to feasibility of more stringent standards.

E. EPA and NHTSA Statutory Authorities

This section briefly summarizes the respective statutory authority for EPA and NHTSA to promulgate the Phase 1 and Phase 2 programs. For additional details of the agencies' authority, see Section XV of this document as well as the Phase 1 rule.[80]

(1) EPA Authority

Statutory authority for the emission standards in this rule is found in CAA section 202(a)(1) and (2) (which requires EPA to establish standards for emissions of pollutants from new motor vehicles and engines which emissions cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare), and in CAA sections 202(a)(3), 202(d), 203–209, 216, and 301 (42 U.S.C. 7521 (a)(1) and (2), 7521(d), 7522–7543, 7550, and 7601).

Title II of the CAA provides for comprehensive regulation of mobile sources, authorizing EPA to regulate emissions of air pollutants from all mobile source categories. When acting under Title II of the CAA, EPA considers such issues as technology effectiveness, its cost (both per vehicle, per manufacturer, and per consumer), the lead time necessary to implement the technology, and based on this the feasibility and practicability of potential standards; the impacts of potential standards on emissions reductions of both GHGs and non-GHG emissions; the impacts of standards on oil conservation and energy security; the impacts of standards on fuel savings by customers; the impacts of standards on the truck industry; other energy impacts; as well as other relevant factors such as impacts on safety.

This action implements a specific provision from Title II, section 202(a). Section 202(a)(1) of the CAA states that "the Administrator shall by regulation prescribe (and from time to time revise) . . . standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles . . ., which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." With EPA's December 2009 final findings that certain greenhouse gases may reasonably be anticipated to endanger public health and welfare and that emissions of GHGs from section 202(a) sources cause or contribute to that endangerment, section 202(a) requires EPA to issue standards applicable to emissions of those pollutants from new motor vehicles. See *Coalition for Responsible Regulation* v. *EPA*, 684 F. 3d at 116–125, 126–27 cert. granted by, in part *Util. Air Regulatory Group* v. *EPA*, 134 S. Ct. 418 (2013), affirmed in part and reversed in part on unrelated grounds by *Util. Air Regulatory Group* v. *EPA*, 134 S. Ct. 2427 (2014) (upholding EPA's endangerment and cause and contribute findings, and further affirming EPA's conclusion that it is legally compelled to issue standards under section 202(a) to address emission of the pollutant which endangers after making the endangerment and cause or contribute findings); see also id. at 127–29 (upholding EPA's light-duty GHG emission standards for MYs 2012–2016 in their entirety).

Other aspects of EPA's legal authority, including its authority under section 202(a), its testing authority under section 203 of the Act, and its enforcement authorities under sections 205 and 207 of the Act are discussed fully in the Phase 1 rule, and need not be repeated here. See 76 FR 57129–57130.

In this final rule, EPA is establishing first-time CO_2 emission standards for trailers hauled by tractors. 80 FR 40170. Certain commenters, notably the Truck Trailer Manufacturers Association (TTMA), maintained that EPA lacks authority to adopt requirements for trailer manufacturers, and that emission standards for trailers could be implemented, if at all, by requirements applicable to the entity assembling a tractor-trailer combination. The argument is that trailers by themselves are not "motor vehicles" as defined in section 216(2) of the Act, that trailer manufacturers therefore do not manufacture motor vehicles, and that standards for trailers can be imposed, if at all, only on "the party that joined the trailer to the tractor." Comments of TTMA, p. 4; Comments of TTMA (March 31, 2016) p. 2.

EPA also proposed a number of changes and clarifications for rules respecting glider kits and glider vehicles. 80 FR 40527–40530. As shown in Figure I.1, a glider kit is a tractor chassis with frame, front axle, interior and exterior cab, and brakes.

[80] 76 FR 57106–57129, September 15, 2011.

Figure I.1 Typical Incomplete Glider Kit Configuration

It is intended for self-propelled highway use, and becomes a glider vehicle when an engine, transmission, and rear axle are added. Engines are often salvaged from earlier model year vehicles, remanufactured, and installed in the glider kit. The final manufacturer of the glider vehicle, *i.e.* the entity that installs an engine, is typically a different manufacturer than the original manufacturer of the glider kit. The final rule contains emission standards for glider vehicles, but does not contain separate standards for glider kits.[81]

Many commenters to both the proposed rule and the NODA supported EPA's interpretation. However, a number of commenters, including Daimler, argued that glider kits are not motor vehicles and so EPA lacks the authority to impose any rules respecting their sale or configuration. Comments of Daimler, pp. 122–23; Comments of Daimler Trucks (April 1, 2016) pp. 2–3. We respond to these comments below, with a more detailed response appearing in RTC Section 1.3.1 and 14.2.

Under the Act, "motor vehicle" is defined as "any self-propelled vehicle designed for transporting persons or property on a street or highway." CAA section 216(2). At proposal, EPA maintained that tractor-trailers are motor vehicles and that EPA therefore has the authority to promulgate emission standards for complete and incomplete vehicles—both the tractor and the trailer. 80 FR 40170. The same proposition holds for glider kits and glider vehicles. Id. at 80 FR 40528. The argument that a trailer, or a glider kit, standing alone, is not self-propelled, and therefore is not a motor vehicle, misses the key issues of authority under the Clean Air Act to promulgate emission standards for motor vehicles produced in discrete segments, and the further issue of the entities—namely "manufacturers"—to which standards and certification requirements apply. Simply put, EPA is authorized to set emission standards for complete and incomplete motor vehicles, manufacturers of complete and incomplete motor vehicles can be required to certify to those emission standards, and there can be multiple manufacturers of a motor vehicle, each of which can be required to certify.

(a) Standards for Complete Vehicles—Tractor-Trailers and Glider Vehicles

Section 202(a)(1) authorizes EPA to set standards "applicable to the emission of any air pollutant from any . . . new motor vehicles." There is no question that EPA is authorized to establish emission standards under this provision for complete new motor vehicles, and thus can promulgate emission standards for air pollutants emitted by tractor-trailers and by glider vehicles.

Daimler maintained in its comments that although a glider vehicle is a motor vehicle, it is not a "new" motor vehicle because "glider vehicles, when constructed retain the identity of the donor vehicle, such that the title has already been exchanged, making the vehicles not 'new' under the CAA." Daimler Comments p. 121; see also the similar argument in Daimler Truck Comments (April 1, 2016), p. 4. Daimler maintains that because title to the powertrain from the donor vehicle has already been transferred, the glider vehicle to which the powertrain is added cannot be "new." Comments of April 1, 2016 p. 4. Daimler also notes that NHTSA considers a truck to be "newly manufactured" and subject to Federal Motor Vehicle Safety Standards when a new cab is used in its assembly, "unless the engine, transmission, and drive axle(s) (as a minimum) of the assembled vehicle are not new, and at least two of these components were taken from the same vehicle." 49 CFR 571.7(e). Daimler urges EPA to adopt a parallel provision here.

First, this argument appears to be untimely. In Phase 1, EPA already indicated that glider vehicles are new motor vehicles, at least implicitly, by

[81] As discussed in sections (c) and (d) below, however, manufacturers of glider kits can, and typically are, responsible for obtaining a certificate of conformity before shipping a glider kit. This is because they are manufacturers of motor vehicles, in this case, an incomplete vehicle.

adopting an interim exemption for them. See 76 FR 57407 (adopting 40 CFR 1037.150(j) indicating that the general prohibition against introducing a vehicle not subject to current model year standards does not apply to MY 2013 or earlier engines). Assuming the argument that glider vehicles are not new can be raised in this rulemaking, EPA notes that the Clean Air Act defines "new motor vehicle" as "a motor vehicle the equitable or legal title to which has never been transferred to an ultimate purchaser" (section 216(3)). Glider vehicles are typically marketed and sold as "brand new" trucks. Indeed, one prominent assembler of glider kits and glider vehicles advertises that "Fitzgerald Glider Kits offers customers the option to purchase a *brand new 2016 tractor,* in any configuration offered by the manufacturer . . . Fitzgerald Glider Kits has mastered the process of taking the 'Glider Kit' and installing the components to work seamlessly *with the new truck.*" [82] The purchaser of a "new truck" necessarily takes initial title to that truck.[83] Daimler would have it that this 'new truck' terminology is a mere marketing ploy, but it obviously reflects reality. As shown in Figure I.1 above, the glider kit constitutes the major parts of the vehicle, lacking only the engine, transmission, and rear axle. The EPA sees nothing in the Act that compels the result that adding a used component to an otherwise new motor vehicle necessarily vitiates classification of the motor vehicle as "new." See 80 FR 40528. Rather, reasonable judgments must be made, and in this case, the agency believes it reasonable that the tail need not wag the dog: Adding the engine and transmission to the otherwise-complete vehicle does not prevent the glider vehicle from being "new"—as marketed. The fact that this approach is reasonable, if not mandated, is confirmed by the language of the Act's definition of "new motor vehicle engine," which includes any "engine in a new motor vehicle" without regard to whether or not the engine was previously used. EPA has also previously addressed the issue of used components in new engines and vehicles explicitly in regulations in the context of locomotives and locomotive engines in 40 CFR part 1033. There we defined remanufactured locomotives and locomotive engines to be "new" locomotives and locomotive engines. See 63 FR 18980; see also Summary and Analysis of Comments on Notice of Proposed Rulemaking for Emission Standards for Locomotives and Locomotive Engines (EPA–420–R–97–101 (December 1997)) at pp. 10–14. This is a further reason that the model year of the engine is not determinative of whether a glider vehicle is "new." As to the suggestion to adopt a provision parallel to the NHTSA definition, EPA notes that the NHTSA definition was developed for different purposes using statutory authority which differs from the Clean Air Act in language and intent. There consequently is no basis for requiring EPA to adopt such a definition, and doing so would impede meaningful control of both GHG emissions and criteria pollutant emissions from glider vehicles.

(b) Standards for Incomplete Vehicles

Section 202(a)(1) not only authorizes EPA to set standards "applicable to the emission of any air pollutant from any . . . new motor vehicles," but states further that these standards are applicable "whether such vehicles . . . are designed as complete systems or incorporate devices to prevent or control such pollution." The Act in fact thus not only contemplates, but in some instances, directly commands that EPA establish standards for incomplete vehicles and vehicle components. See CAA section 202(a)(6) (standards for onboard vapor recovery systems on "new light-duty vehicles," and requiring installation of such systems); section 202(a)(5)(A) (standards to control emissions from refueling motor vehicles, and requiring consideration of, and possible design standards for, fueling system components); 202(k) (standards to control evaporative emissions from gasoline-fueled motor vehicles). Both TTMA and Daimler argued, in effect, that these provisions are the exceptions that prove the rule and that without this type of enumerated exception, only entire, complete vehicles can be considered to be "motor vehicles." This argument is not persuasive. Congress did not indicate that these incomplete vehicle provisions were exceptions to the definition of motor vehicle. Just the opposite. Without amending the new motor vehicle definition, or otherwise indicating that these provisions were not already encompassed within Title II authority over "new motor vehicles", Congress required EPA to set standards for evaporative emissions from a portion of a motor vehicle. Congress thus indicated in these provisions: (1) That standards should apply to "vehicles" whether or not the "vehicles" were designed as complete systems; (2) that some standards should explicitly apply only to certain components of a vehicle that are plainly not self-propelled. Congress thus necessarily was of the view that incomplete vehicles can be motor vehicles.

Emission standards EPA sets pursuant to this authority thus can be, and often are focused on emissions from the new motor vehicle, and from portions, systems, parts, or components of the vehicle. Standards thus apply not just to exhaust emissions, but to emissions from non-exhaust portions of a vehicle, or from specific vehicle components or parts. See the various evaporative emission standards for light duty vehicles in 40 CFR part 86, subpart B (*e.g.*, 40 CFR 86.146–96 and 86.150–98 (refueling spitback and refueling test procedures); 40 CFR 1060.101–103 and 73 FR 59114–59115 (various evaporative emission standards for small spark ignition equipment); 40 CFR 86.1813–17(a)(2)(iii) (canister bleed evaporative emission test procedure, where testing is solely of fuel tank and evaporative canister); see also 79 FR 23507 (April 28, 2014) (incomplete heavy duty gasoline vehicles could be subject to, and required to certify compliance with, evaporative emission standards)). These standards are implemented by testing the particular vehicle component, not by whole vehicle testing, notwithstanding that the component may not be self-propelled until it is installed in the vehicle or (in the case of non-road equipment), propelled by an engine.[84]

EPA thus can set standards for all or just a portion of the motor vehicle notwithstanding that an incomplete motor vehicle may not yet be self-propelled. This is not to say that the Act authorizes emission standards for any part of a motor vehicle, however insignificant. Under the Act it is reasonable to consider both the significance of the components in comparison to the entire vehicle and the significance of the components for achieving emissions reductions. A vehicle that is complete except for an ignition switch can be subject to standards even though it is not self-

[82] Advertisement for Fitzgerald Glider kits in Overdrive magazine (December 2015) (emphasis added).

[83] Fitzgerald states "All Fitzgerald glider kits will be titled in the state of Tennessee and you will receive a title to transfer to your state." *https://www.fitzgeraldgliderkits.com/frequently-asked-questions.* Last accessed July 9, 2016.

[84] "Non-road vehicles" are defined differently than "motor vehicles" under the Act, but the difference does not appear relevant here. Non-road vehicles, like motor vehicles, must be propelled by an engine. See CAA section 216(11) ("'nonroad vehicle' means a vehicle that is powered by a nonroad engine"). Pursuant to this authority, EPA has promulgated many emission standards applicable to components of engineless non-road equipment, for which the equipment manufacturer must certify.

propelled. Likewise, as just noted, vehicle components that are significant for controlling evaporative emissions can be subject to standards even though in isolation the components are not self-propelled. However, not every individual component of a complete vehicle can be subjected to standards as an incomplete vehicle. To reflect these considerations, EPA is adopting provisions stating that a trailer is a vehicle "when it has a frame with one or more axles attached," and a glider kit becomes a vehicle when "it includes a passenger compartment attached to a frame with one or more axles." Section 1037.801 definition of "vehicle," paragraphs (1)(ii) and (iii); see also Section XIII.B below.

TTMA and Daimler each maintained that this claim of authority is open-ended, and can be extended to the least significant vehicle part. As noted above, EPA acknowledges that lines need to be drawn, but whether looking at the relation between the incomplete vehicle and the complete vehicle, or looking at the relation between the incomplete vehicle and the emissions control requirements, it is evident that trailers and glider kits should properly be treated as vehicles, albeit incomplete ones.[85] They properly fall on the vehicle side of the line. When one finishes assembling a whole aggregation of parts to make a finished section of the vehicle (*e.g.* the trailer), that is sufficient. You have an entire, complete section made up of assembled parts. Everything needed to be a trailer is complete. This is not an engine block, a wheel, or a headlight. Similarly, glider kits comprise the largely assembled tractor chassis with front axles, frame, interior and exterior cab, and brakes. This is not a few assembled components; rather, it is an assembled truck with a few components missing. See CAA section 216(9) of the Act, which defines "motor vehicle or engine part manufacturer" as "any person engaged in the manufacturing, assembling or rebuilding of any device, system, part, component or element of design which is installed in or on motor vehicles or motor vehicle engines." Trailers and glider kits are not "installed in or on" a motor vehicle. A trailer is half of the tractor-trailer, not some component installed on the tractor. And one would more naturally refer to the donor drivetrain being installed on the glider kit than vice versa. See Figure I.1 above. Furthermore, as discussed below, the trailer and the glider kit are significant for purposes of controlling emissions from the completed vehicle.

Incomplete vehicle standards must, of course, be reasonably designed to control emissions caused by that particular vehicle segment. The standards for trailers would do so and account for the tractor-trailer combination by using a reference tractor in the trailer test procedure (and, conversely, by use of a reference trailer in the tractor test procedure). The Phase 2 rule contains no emission standards for glider kits in isolation, but the standards for glider vehicles necessarily reflect the contribution of the glider kit.

(c) Application of Emission Standards to Manufacturers

In some ways, the critical issue is to whom these emission standards apply. As explained in this section, the emission standards apply to manufacturers of motor vehicles, and manufacturers thus are required to test and to certify compliance to those standards. Moreover, the Act contemplates that a motor vehicle can have multiple manufacturers. With respect to the further question of which manufacturer certifies and tests in multiple manufacturer situations, EPA rules have long contained provisions establishing responsibilities where a vehicle has multiple manufacturers. We are applying those principles in the Phase 2 rules. The overarching principle is that the entity with most control over the particular vehicle segment due to producing it is usually the most appropriate entity to test and certify.[86] EPA is implementing the trailer and glider vehicle emission standards in accord with this principle, so that the entities required to test and certify are the trailer manufacturer and, for glider kits and glider vehicles, either the manufacturer of the glider kit or glider vehicle, depending on which is more appropriate in individual circumstances.

(i) Definition of Manufacturer

Emission standards are implemented through regulation of the manufacturer of the new motor vehicle. See, *e.g.* section 206(a)(1) (certification testing of motor vehicle submitted by "a manufacturer"); 203(a)(1) (manufacturer of new motor vehicle prohibited from introducing uncertified motor vehicles into commerce); 207(a)(1) (manufacturer of motor vehicle to provide warranty to ultimate purchaser of compliance with applicable emission standards); 207(c) (recall authority); 208(a) (recordkeeping and testing can be required of every manufacturer of new motor vehicle).

The Act further distinguishes between manufacturers of motor vehicles and manufacturers of motor vehicle parts. See, *e.g.* section 206(a)(2) (voluntary emission control system verification testing); 203(a)(3)(B) (prohibition on parts manufacturers and other persons relating to defeat devices); 207(a)(2) (parts manufacturer may provide warranty certification regarding use of parts); 208(a) (recordkeeping and testing requirements for manufacturers of vehicle and engine "parts or components").

Thus, the question here is whether a trailer manufacturer or glider kit manufacturer can be a manufacturer of a new motor vehicle and thereby become subject to the certification and related requirements for manufacturers, or must necessarily be classified as a manufacturer of a motor vehicle part or component. EPA may reasonably classify trailer manufacturers and glider kit manufacturers as motor vehicle manufacturers.

Section 216(1) defines a "manufacturer" as "any person engaged in the manufacturing or assembling of new motor vehicles, new motor vehicle engines, new nonroad vehicles or new nonroad engines, or importing such vehicles or engines for resale, or who acts for and is under the control of any such person in connection with the distribution of new motor vehicles, new motor vehicle engines, new nonroad vehicles or new nonroad engines, but shall not include any dealer with respect to new motor vehicles, new motor vehicle engines, new nonroad vehicles or new nonroad engines received by him in commerce."

It appears plain that this definition was not intended to restrict the definition of "manufacturer" to a single person per vehicle. The use of the conjunctive, specifying that a manufacturer is "*any* person engaged in the manufacturing or assembling of new motor vehicles . . . *or* who acts for and is under the control of any such person

[85] Cf. *Marine Shale Processors* v. *EPA*, 81 F. 3d 1371, 1383 (5th Cir. 1996) ("[w]e make no comment on this argument: This is simply not a thimbleful case").

[86] See discussion of standards applicable to small SI equipment fuel systems, implemented by standards for the manufacturers of that equipment at 73 FR 59115 ("In most cases, nonroad standards apply to the manufacturer of the engine or the manufacturer of the nonroad equipment. Here, the products subject to the standards (fuel lines and fuel tanks) are typically manufactured by a different manufacturer. In most cases the engine manufacturers do not produce complete fuel systems and therefore are not in a position to do all the testing and certification work necessary to cover the whole range of products that will be used. We are therefore providing an arrangement in which manufacturers of fuel-system components are in most cases subject to the standards and are subject to certification and other compliance requirements associated with the applicable standards").

. . ." (emphasis added) indicates that Congress anticipated that motor vehicles could have more than one manufacturer, since in at least some cases those will plainly be different people. The capacious reference to "any person engaged in the manufacturing of motor vehicles" likewise allows the natural inference that it could apply to multiple entities engaged in manufacturing.[87]

The provision also applies both to entities that manufacture and entities that assemble, and does so in such a way as to encompass multiple parties: Manufacturers "or" (rather than 'and') assemblers are included. Nor is there any obvious reason that only one person can be engaged in vehicle manufacture or vehicle assembling.

Reading the Act to provide for multiple motor vehicle manufacturers reasonably reflects industry realities, and achieves important goals of the CAA. Since title II requirements are generally imposed on "manufacturers" it is important that the appropriate parties be included within the definition of manufacturer—"any person engaged in the manufacturing or assembling of new motor vehicles." Indeed, as set out in Chapter 1 of the RIA, most heavy duty vehicles are manufactured or assembled by multiple entities; see also Comments of Daimler (October 1, 2015) p. 103.[88] One entity produces a chassis; a different entity manufactures the engine; specialized components (*e.g.* garbage compactors, cement mixers) are produced by still different entities. For tractor-trailers, one person manufactures the tractor, another the trailer, a third the engine, and another typically assembles the trailer to the tractor. Installation of various vehicle components occurs at different and varied points and by different entities, depending on ultimate desired configurations. See, *e.g.* Comments of Navistar (October 1, 2015), pp. 12–13. The heavy duty sector thus differs markedly from the light duty sector (and from manufacturing of light duty pickups and vans), where a single company designs the vehicle and engine (and many of the parts), and does all assembling of components into the finished motor vehicle.

(ii) Controls on Manufacturers of Trailers

It is reasonable to view the trailer manufacturer as "engaged in" (section 216(1)) the manufacturing or assembling of the tractor-trailer. The trailer manufacturer designs, builds, and assembles a complete and finished portion of the tractor-trailer. All components of the trailer—the tires, axles, flat bed, outsider cover, aerodynamics—are within its control and are part of its assembling process. The trailer manufacturer sets the design specifications that affect the GHG emissions attributable to pulling the trailer. It commences all work on the trailer, and when that work is complete, nothing more is to be done. The trailer is a finished product. With respect to the trailer, the trailer manufacturer is analogous to the manufacturer of the light duty vehicle, specifying, controlling, and assembling all aspects of the product from inception to completion. GHG emissions attributable to the trailer are a substantial portion of the total GHG emissions from the tractor-trailer.[89] Moreover, the trailer manufacturer is not analogous to the manufacturer of a vehicle part or component, like a tire manufacturer, or to the manufacturer of a side skirt. The trailer is a significant, integral part of the finished motor vehicle, and is essential for the tractor-trailer to carry out its commercial purpose. See 80 FR 40170. Although it is true that another person may ultimately hitch the trailer to a tractor (which might be viewed as completing assembly of the tractor-trailer), as noted above, EPA does not believe that the fact that one person might qualify as a manufacturer, due to "assembling" the motor vehicle, precludes another person from qualifying as a manufacturer, due to "manufacturing" the motor vehicle. Given that section 216(1) does not restrict motor vehicle manufacturers to a single entity, it appears to be consistent with the facts and the Act to consider trailer manufacturers as persons engaged in the manufacture of a motor vehicle.

This interpretation of section 216(1) is also reasonable in light of the various provisions noted above relating to implementation of the emissions standards—certification under section 206, prohibitions on entry into commerce under section 203, warranty and recall under section 207, and recordkeeping/reporting under section 208. All of these provisions are naturally applied to the entity responsible for manufacturing the trailer, which manufacturer is likewise responsible for its GHG emissions.

TTMA maintains that if a tractor-trailer is a motor vehicle, then only the entity connecting the trailer to the tractor could be subject to regulation.[90] This is not a necessary interpretation of section 216(1), as explained above. TTMA does not discuss that provision, but notes that other provisions refer to "a" manufacturer (or, in one instance, "the" manufacturer), and maintains that this shows that only a single entity can be a manufacturer. See TTMA Comment pp. 4–5, citing to sections 206(a)(1), 206(b), 207, and 203(a). This reading is not compelled by the statutory text. First, the term "manufacturer" in all of these provisions necessarily reflects the underlying definition in section 216(1), and therefore is not limited to a single entity, as just discussed. Second, the interpretation makes no practical sense. An end assembler of a tractor-trailer is not in a position to certify and warrant performance of the trailer, given that the end-assembler has no control over how trailers are designed, constructed, or even which trailers are attached to the tractor. It makes little sense for the entity least able to control the outcome to be responsible for that outcome. The EPA doubts that Congress compelled such an ungainly implementation mechanism, especially given that it is well known that vehicle manufacture responsibility in the heavy duty vehicle sector is divided, and given further that title II includes requirements for EPA to promulgate emission standards for portions of vehicles.

(iii) Controls on Manufacturers of Glider Kits

Application of these same principles indicate that a glider kit manufacturer is a manufacturer of a motor vehicle and, as an entity responsible for assuring that glider vehicles meet the Phase 2 vehicle emission standards, can be a party in the certification process as either the certificate holder or the entity which provides essential test information to the glider vehicle manufacturer. As noted above, glider kits include the entire tractor chassis, cab, tires, body, and brakes. Glider kit manufacturers thus control critical elements of the

[87] See *United States* v. *Gonzales*, 520 U.S. 1, 5, (1997) ("Read naturally the word 'any' has an expansive meaning, that is, 'one or some indiscriminately of whatever kind'); *New York* v. *EPA*, 443 F.3d 880, 884–87 (D.C. Cir. 2006).

[88] "The EPA should understand that vehicle manufacturing is a multi-stage process (regardless of the technologies on the vehicles) and that each stage of manufacturer has the incentive to properly complete manufacturing . . . [T]he EPA should continue the longstanding industry practice of allowing primary manufacturers to pass incomplete vehicles with incomplete vehicle documents to secondary manufacturers who complete the installation."

[89] The relative contribution of trailer controls depends on the types of tractors and trailers, as well as the tier of standards applicable; however, it can be approximately one-third of the total reduction achievable for the tractor-trailer.

[90] Consequently, the essential issue here is not whether EPA can issue and implement emission standards for trailers, but at what point in the implementation process those standards apply.

ultimate vehicle's greenhouse gas emissions, in particular, all aerodynamic features and all emissions related to steer tire type. Glider kit manufacturers would therefore be the entity generating critical GEM inputs—at the least, those for aerodynamics and tires. Glider kit manufacturers also often know the final configuration of the glider vehicle, *i.e.* the type of engine and transmission which the final assembler will add to the glider kit.[91] This is because the typical glider kit contains all necessary wiring, and it is necessary, in turn, for the glider kit manufacturer to know the end configuration in order to wire the kit properly. Thus, a manufacturer of a glider kit can reasonably be viewed as a manufacturer of a motor vehicle under the same logic as above: There can be multiple manufacturers of a motor vehicle; the glider kit manufacturer designs, builds, and assembles a substantial, complete and finished portion of the motor vehicle; and that portion contributes substantially to the GHG emissions from the ultimate glider vehicle. A glider kit is not a vehicle part; rather, it is an assembled truck with a few components missing.

EPA rules have long provided provisions establishing responsibilities where there are multiple manufacturers of motor vehicles. See 40 CFR 1037.620 (responsibilities for multiple manufacturers), 40 CFR 1037.621 (delegated assembly), and 40 CFR 1037.622 (shipment of incomplete vehicles to secondary vehicle manufacturers). These provisions, in essence, allow manufacturers to determine among themselves as to which should be the certificate holder, and then assign respective responsibilities depending on that decision. The end result is that incomplete vehicles cannot be introduced into commerce without one of the manufacturers being the certificate holder.

Under the Phase 1 rules, glider kits are considered to be incomplete vehicles which may be introduced into commerce to a secondary manufacturer for final assembly. See 40 CFR 1037.622(b)(1)(i) and 1037.801 (definition of "vehicle" and "incomplete vehicle") of the Phase 1 regulations (76 FR 57421). Note that 40 CFR 1037.622(b)(1)(i) was originally codified as 40 CFR 1037.620(b)(1)(i). EPA is expanding somewhat on these provisions, but in essence, as under Phase 1, glider kit and glider vehicle manufacturers could operate under delegated assembly provisions whereby the glider kit manufacturer would be the certificate holder. See 40 CFR 1037.621 of the final regulations. Glider kit manufacturers would also continue to be able to ship uncertified kits to secondary manufacturers, and the secondary manufacturer must assemble the vehicle into certifiable condition. 40 CFR 1037.622.[92]

(d) Additional Authorities Supporting EPA's Actions

Even if, against our view, trailers and glider kits are not considered to be "motor vehicles," and the entities engaged in assembling trailers and glider kits are not considered to be manufacturers of motor vehicles, the Clean Air Act still provides authority for the testing requirements adopted here. Section 208 (a) of the Act authorizes EPA to require "every manufacturer of new motor vehicle or engine parts or components" to "perform tests where such testing is not otherwise reasonably available." This testing can be required to "provide information the Administrator may reasonably require to determine whether the manufacturer . . . has acted or is acting in compliance with this part," which includes showing whether or not the parts manufacturer is engaged in conduct which can cause a prohibited act. Testing would be required to show that the trailer will conform to the vehicle emission standards. In addition, testing for trailer manufacturers would be necessary here to show that the trailer manufacturer is not causing a violation of the combined tractor-trailer GHG emission standard either by manufacturing a trailer which fails to comply with the trailer emission standards, or by furnishing a trailer to the entity assembling tractor-trailers inconsistent with tractor-trailer certified condition. Testing for glider kit manufacturers is necessary to prevent a glider kit manufacturer furnishing a glider kit inconsistent with the tractor's certified condition. In this regard, we note that section 203 (a)(1) of the Act not only prohibits certain acts, but also prohibits "the causing" of those acts. Furnishing a trailer not meeting the trailer standard would cause a violation of that standard, and the trailer manufacturer would be liable under section 203 (a)(1) for causing the prohibited act to occur. Similarly, a glider kit supplied in a condition inconsistent with the tractor standard would cause the manufacturer of the glider vehicle to violate the GHG emission standard, so the glider kit manufacturer would be similarly liable under section 203 (a)(1) for causing that prohibited act to occur.

In addition, section 203 (a)(3)(B) prohibits use of 'defeat devices'—which include "any part or component intended for use with, or as part of, any motor vehicle . . . where a principal effect of the part or component is to . . . defeat . . . any . . . element of design installed . . . in a motor vehicle" otherwise in compliance with emission standards. Manufacturing or installing a trailer not meeting the trailer emission standard could thus be a defeat device causing a violation of the emission standard. Similarly, a glider kit manufacturer furnishing a glider kit in a configuration that would not meet the tractor standard when the specified engine, transmission, and axle are installed would likewise cause a violation of the tractor emission standard. For example, providing a tractor with a coefficient of drag or tire rolling resistance level inconsistent with tractor certified condition would be a violation of the Act because it would cause the glider vehicle assembler to introduce into commerce a new tractor that is not covered by a *valid* certificate of conformity. Daimler argued in its comments that a glider kit would not be a defeat device because glider vehicles use older engines which are more fuel efficient since they are not meeting the more rigorous standards for criteria pollutant emissions. (Daimler Truck Comment, April 1, 2016, p. 5). However, the glider kit would be a defeat device with respect to the tractor *vehicle* standard, not the separate engine standard. A non-conforming glider kit would adversely affect compliance with the vehicle standard, as just explained. Furthermore, as explained in RTC Section 14.2, Daimler is incorrect that glider vehicles are more fuel efficient than Phase 1 2017 and later vehicles, much less Phase 2 vehicles.

In the memorandum accompanying the Notice of Data Availability, EPA solicited comment on adopting additional regulations based on these principles. EPA has decided not to adopt those provisions, but again notes

[91] PACCAR indicated in its comments that manufacturers of glider kits may not know all details of final assembly. Provisions on delegated assembly, shipment of incomplete vehicles to secondary manufacturers, and assembly instructions for secondary vehicle manufacturers allow manufacturers of glider kits and glider vehicles to apportion responsibilities, as appropriate, including responsibility as to which entity shall be the certificate holder. See 40 CFR 1037.130, 1037.621, and 1037.622. Our point here is that both of these entities are manufacturers of the glider motor vehicle and therefore that both are within the Act's requirements for certification and testing.

[92] Under this provision in the Phase 2 regulations, the glider kit manufacturer would still have some responsibility to ensure that products they introduce into U.S. commerce will conform with the regulations when delivered to the ultimate purchasers.

that the authorities in CAA sections 208 and 203 support the actions EPA is taking here with respect to trailer and glider kit testing.

(e) Standards for Glider Vehicles and Lead Time for Those Standards

At proposal, EPA indicated that engines used in glider vehicles are to be certified to standards for the model year in which these vehicles are assembled. 80 FR 40528. This action is well within the agency's legal authority. As noted above, the Act's definition of "new motor vehicle engine," includes any "engine in a new motor vehicle" without regard to whether or not the engine was previously used. Given the Act's purpose of controlling emissions of air pollutants from motor vehicle engines, with special concern for pollutant emissions from heavy-duty engines (see, *e.g.*, section 202(a)(3)(A) and (B)), it is reasonable to require engines placed in newly-assembled vehicles to meet the same standards as all other engines in new motor vehicles. Put another way, it is both consistent with the plain language of the Act and reasonable and equitable for the engines in "new trucks" (see Section I.E.(1)(a) above) to meet the emission standards for all other engines installed in new trucks.

Daimler challenged this aspect of EPA's proposal, maintaining that it amounted to regulation of vehicle rebuilding, which (according to the commenter) is beyond EPA's authority. Comments of Daimler, p. 123; Comments of Daimler Trucks (April 1, 2016) p. 3. This comment is misplaced. The EPA has authority to regulate emissions of pollutants from engines installed in new motor vehicles. As explained in subsection (a) above, glider vehicles are new motor vehicles. As also explained above, the Act's definition of "new motor vehicle engine" includes any "engine in a new motor vehicle" without regard to whether or not the engine was previously used. CAA section 216(3). Consequently, a previously used engine installed in a glider vehicle is within EPA's multiple authorities. See CAA sections 202(a)(1) (GHGs), 202(a)(3)(A) and (B)(ii) (hydrocarbon, CO, PM and NO_X from heavy-duty vehicles or engines), and 202(a)(3)(D) (pollutants from rebuilt heavy duty engines).[93]

As explained in more detail in Section XIII.B, the final rule requires that as of January 1, 2017, glider kit and glider vehicle production involving engines not meeting criteria pollutant standards corresponding to the year of glider vehicle assembly be allowed at the highest annual production for any year from 2010 to 2014. See section 1037.150(t)(3). (Certain exceptions to this are explained in Section XIII.B.) The rule further requires that as of January 1, 2018, engines in glider vehicles meet criteria pollutant standards and GHG standards corresponding to the year of the glider vehicle assembly, but allowing certain small businesses to introduce into commerce vehicles with engines meeting criteria pollutant standards corresponding to the year of the engine for up to 300 vehicles per year, or up to the highest annual production volume for calendar years 2010 to 2014, whichever is less. Section 1037.150(t)(1)(ii) (again subject to various exceptions explained in Section XIII.B). Glider vehicles using these exempted engines will not be subject to the Phase 1 GHG *vehicle* standards, but will be subject to the Phase 2 vehicle standards beginning with MY 2021. As explained in Section XIII.B, there are compelling environmental reasons for taking these actions in this time frame.

With regard to the issue of lead time, EPA indicated at proposal that the agency has long since justified the criteria pollutant standards for engines installed in glider kits. 80 FR 40528. EPA further proposed that engines installed in glider vehicles meet the emission standard for the year of glider vehicle assembly, as of January 1, 2018 and solicited comment on an earlier effective date. Id. at 40529. The agency noted that CAA section 202(a)(3)(D)[94] requires that standards for rebuilt heavy-duty engines take effect "after a period . . . necessary to permit the development and application of the requisite control measures." Here, no time is needed to develop and apply requisite control measures for criteria pollutants because compliant engines are immediately available. In fact, manufacturers of compliant engines, and dealers of trucks containing those compliant engines, commented that they are disadvantaged by manufacturing more costly compliant engines while glider vehicles avoid using those engines. Not only are compliant engines immediately available, but (as commenters warned) there can be risk of massive pre-buys. Moreover, EPA does not envision that glider manufacturers will actually modify the older engines to meet the applicable standards. Rather, they will either choose from the many compliant engines available today, or they will seek to qualify under other flexibilities provided in the final rule. See Section XIII.B. Given that compliant engines are immediately available, the flexibilities provided in the final rule for continued use of donor engines for traditional glider vehicle functions and by small businesses, and the need to expeditiously prevent further perpetuation of use of heavily polluting engines, EPA sees a need to begin constraining this practice on January 1, 2017. However, the final rule is merely capping glider production using higher-polluting engines in 2017 at 2010–2014 production levels, which would allow for the production of thousands of glider vehicles using these higher polluting engines, and unlimited production of glider vehicles using less polluting engines.

Various commenters, however, argued that the EPA must provide four years lead-time and three-year stability pursuant to section 202(a)(3)(C) of the Act, which applies to regulations for criteria pollutant emissions from heavy duty vehicles or engines. For criteria pollutant standards, CAA section 202(a)(3)(C) establishes lead time and stability requirements for "[a]ny standard promulgated or revised under this paragraph and applicable to classes or categories of heavy duty vehicles or engines." In this rule, EPA is generally requiring large manufacturers of glider vehicles to use engines that meet the standards for the model year in which a vehicle is manufactured. EPA is not promulgating new criteria pollutant standards. The NO_X and PM standards that apply to heavy duty engines were promulgated in 2001.

We are not amending these provisions or promulgating new criteria pollutant standards for heavy duty engines here. EPA interprets the phrase "classes or categories of heavy duty vehicles or engines" in CAA section 202(a)(3)(C) to refer to categories of vehicles established according to features such as their weight, functional type, (*e.g.* tractor, vocational vehicle, or pickup truck) or engine cycle (spark-ignition or compression-ignition), or weight class of the vehicle into which an engine is installed (LHD, MHD, or HHD). EPA has established several different categories

[93] Comments from, *e.g.* Mondial and MEMA made clear that all of the donor engines installed in glider vehicles are rebuilt. See also *http://www.truckinginfo.com/article/story/2013/04/the-return-of-the-glider.aspx* ("1999 to 2002-model diesels were known for reliability, longevity and good fuel mileage. Fitzgerald favors Detroit's 12.7-liter Series 60 from that era, but also installs pre-EGR 14-liter Cummins and 15-liter Caterpillar diesels. All are rebuilt. . . .").

[94] The engine rebuilding authority of section 202(a)(3)(D) includes removal of an engine from the donor vehicle. See 40 CFR 86.004–40 and 62 FR 54702 (Oct. 21, 1997). EPA interprets this language as including installation of the removed engine into a glider kit, thereby assembling a glider vehicle.

of heavy duty vehicles (distinguished by gross vehicle weight, engine-cycle, and other criteria related to the vehicles' intended purpose) and is establishing in this rule GHG standards applicable to each category.[95] By contrast, a "glider vehicle" is defined not by its weight or function but by its method of manufacture. A Class 8 tractor glider vehicle serves exactly the same function and market as a Class 8 tractor manufactured by another manufacturer. Similarly, rebuilt engines installed in glider vehicles (*i.e.* donor engines) are not distinguished by engine cycle, but rather serve the same function and market as any other HHD or MHD engine. Thus, EPA considers "glider vehicles" to be a description of a method of manufacturing new motor vehicles, not a description of a separate "class or category" of heavy duty vehicles or engines. Consequently, EPA is not adopting new standards for a class or category of heavy duty engines within the meaning of section 202(a)(3)(C) of the Act.

EPA believes this approach is most consistent with the statutory language and the goals of the Clean Air Act. The date of promulgation of the criteria pollutant standards was 2001. There has been plenty of lead time for the criteria pollutant standards and as a result, manufacturers of glider vehicles have many options for compliant engines that are available on the market today—just as manufacturers of other new heavy-duty vehicles do. We are even providing additional compliance flexibilities to glider manufacturers in recognition of the historic practice of salvaging a small number of engines from vehicles involved in crashes. See Section XIII.B. We do not believe that Congress intended to allow changes in how motor vehicles are manufactured to be a means of avoiding existing, applicable engine standards. Obviously, any industry attempts to avoid or circumvent standards will not become apparent until the standards begin to apply. The commenters' interpretation would effectively preclude EPA from curbing many types of avoidance, however dangerous, until at least four years from detection.

As to Daimler's further argument that the lead time provisions in section 202(3)(C) not only apply but also must trump those specifically applicable to heavy duty engine rebuilding, the usual rule of construction is that the more specific provision controls. See, *e.g.* *HCSC-Laundry* v. *U.S.*, 450 U.S.1, 6 (1981). Daimler's further argument that section 202(a)(3)(C) lead time provisions also apply to engine rebuilding because those provisions fall within the same paragraph would render the separate lead time provisions for engine rebuilding a virtual nullity. The sense of the provision is that Congress intended there to be independent lead time consideration for the distinct practice of engine rebuilding. In any case, as just explained, it is EPA's view that section 202(a)(3)(C) does not apply here.

(2) NHTSA Authority

The Energy Policy and Conservation Act (EPCA) of 1975 mandates a regulatory program for motor vehicle fuel economy to meet the various facets of the need to conserve energy. In December 2007, Congress enacted the Energy Independence and Security Act (EISA), amending EPCA to require, among other things, the creation of a medium- and heavy-duty fuel efficiency program for the first time.

Statutory authority for the fuel consumption standards in this final rule is found in EISA section 103, 49 U.S.C. 32902(k). This section authorizes a fuel efficiency improvement program, designed to achieve the maximum feasible improvement to be created for commercial medium- and heavy-duty on-highway vehicles and work trucks, to include appropriate test methods, measurement metrics, standards, and compliance and enforcement protocols that are appropriate, cost-effective and technologically feasible.

NHTSA has responsibility for fuel economy and consumption standards, and assures compliance with EISA through rulemaking, including standard-setting; technical reviews, audits and studies; investigations; and enforcement of implementing regulations including penalty actions. This rule continues to fulfill the requirements of section 103 of EISA, which instructs NHTSA to create a fuel efficiency improvement program for "commercial medium- and heavy-duty on-highway vehicles and work trucks" by rulemaking, which is to include standards, test methods, measurement metrics, and enforcement protocols. See 49 U.S.C. 32902(k)(2).

Congress directed that the standards, test methods, measurement metrics, and compliance and enforcement protocols be "appropriate, cost-effective, and technologically feasible" for the vehicles to be regulated, while achieving the "maximum feasible improvement" in fuel efficiency. NHTSA has broad discretion to balance the statutory factors in section 103 in developing fuel consumption standards to achieve the maximum feasible improvement.

As discussed in the Phase 1 final rule, NHTSA has determined that the five year statutory limit on average fuel economy standards that applies to passengers and light trucks is not applicable to the HD vehicle and engine standards. As a result, the Phase 1 HD engine and vehicle standards remain in effect indefinitely at their 2018 or 2019 MY levels until amended by a future rulemaking action. As was contemplated in that rule, NHTSA is finalizing a Phase 2 rulemaking action. Therefore, the Phase 1 standards will not remain in effect at their 2018 or 2019 MY levels indefinitely; they will remain in effect until the MY Phase 2 standards begin. In accordance with section 103 of EISA, NHTSA will ensure that not less than four full MYs of regulatory lead-time and three full MYs of regulatory stability are provided for in the Phase 2 standards.

With respect to the proposal, many stakeholders opined in their comments as to NHTSA's legal authority to issue the Phase 2 medium- and heavy-duty standards (Phase 2 standards), in whole or in part. NHTSA addresses these comments in the following discussion.

Allison Transmission, Inc. (Allison) questioned NHTSA's authority to issue the Phase 2 Standards. Allison stated that the Energy Independence and Security Act of 2007 (EISA)[96] directs NHTSA to undertake "*a* rulemaking proceeding," (emphasis added) predicated on a study by the National Academy of Sciences (NAS). Allison and the Truck Trailer Manufacturers Association (TTMA) asserted that because NAS has published a study on medium- and heavy duty vehicles and NHTSA promulgated the Phase 1 medium- and heavy-duty vehicle standards (Phase 1 standards), NAS and NHTSA have fulfilled their statutory duties under EISA. Thus, Allison stated, NHTSA has no authority to issue standards beyond the Phase 1 standards.

NHTSA maintains that EISA allows the agency to promulgate medium- and heavy duty fuel efficiency standards beyond the Phase 1 standards. EISA states that NHTSA:[97]

by regulation, shall determine in a rulemaking proceeding how to implement a commercial medium- and heavy-duty on-highway vehicle and work truck fuel

[95] Note, however, the Phase 2 GHG standards for tractors and vocational vehicles do not apply until MY 2021.

[96] Public Law 110–140, 121 Stat. 1492. (December 19, 2007).

[97] By delegation at 49 CFR 1.95(a). For purposes of this NPRM, grants of authority from EISA to the Secretary of Transportation regarding fuel efficiency will be referred to as grants of authority to NHTSA, as NHTSA has been delegated the authority to implement these programs.

To: Baptist, Erik[baptist.erik@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Bolen, Brittany[bolen.brittany@epa.gov]
Cc: Schmidt, Lorie[Schmidt.Lorie@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]; cookleila@ymail.com[cookleila@ymail.com]; Kataoka, Mark[Kataoka.Mark@epa.gov]
From: Hengst, Benjamin
Sent: Tue 8/15/2017 1:55:23 PM
Subject: Glider response letter (revised draft), plus some other materials
HD gliders intent to revisit 8.15.17.docx
Fitzgerald et al petition for reconsideration of EPA's glider kit regula....pdf
Heavy-duty Phase 2 NPRM and FRM discussion of EPA authority to regulate ....pdf

Hi folks—attached is an updated draft glider response letter for your review.

Please note that OGC career staff have not reviewed the draft letter yet (Mark was out; David is out). I'm copying Mark (who returns to the office today) and Lorie here so they have a chance to look at this as well.

During our briefing last Friday there were a number of questions and discussions regarding what the Petitioners stated in their letter to EPA, and what the Clean Air Act actually says regarding EPA's authority to establish standards for new motor vehicles and for rebuilt heavy-duty engines. In addition to the draft letter, we have also attached 2 items related to those topics to supplement last Friday's briefing material. We thought this might be helpful for reference.

Deliberative Process Privilege/Ex. 5

Deliberative Process Privilege/Ex. 5

We'll move this letter once review has concluded. Thanks, Ben

To: A-AND-R-DOCKET[A-AND-R-DOCKET@epa.gov]; Grundler, Christopher[grundler.christopher@epa.gov]; Charmley, William[charmley.william@epa.gov]; Orlin, David[Orlin.David@epa.gov]; Simon, Karl[Simon.Karl@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]; ryan.hagen@dot.gov[ryan.hagen@dot.gov]; Jeffrey.Rosen@dot.gov[Jeffrey.Rosen@dot.gov]
Cc: Glen Darbyshire[GDarbyshire@bouhan.com]; Jeff Sims[jeff@ttmanet.org]; Theodore, Elisabeth[Elisabeth.Theodore@apks.com]; Fayne, Zachary[Zachary.Fayne@apks.com]
From: Martel, Jonathan S.
Sent: Mon 6/26/2017 9:30:07 PM
Subject: TTMA Petition for Reconsideration and Stay
TTMA Petition for Reconsideration and Stay.PDF

All –

Please see attached Petition for Reconsideration and Stay on behalf of the Truck Trailer Manufacturers Association with regard to GHG and fuel economy standards for trailers. This is also being transmitted by first class mail. Thank you very much.

Sincerely,

Jonathan Martel

Jonathan S. Martel
Partner

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Jonathan S. Martel
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June 26, 2017

VIA EMAIL AND U.S. MAIL

Mr. Scott Pruitt, Administrator
Environmental Protection Agency
1200 Pennsylvania Ave., N.W.
Mail Code: 1101A
Washington, DC 20460

Mr. Jack Danielson, Acting Deputy Administrator
National Highway Traffic Safety Administration
1200 New Jersey Ave., S.E.
Washington, DC 20590

Re: Truck Trailer Manufacturers Association Petition for Reconsideration and Stay of GHG and Fuel Efficiency Standards -- Docket No. EPA-HQ-OAR-2014-0827

Dear Administrator Pruitt and Acting Deputy Administrator Danielson:

Enclosed please find the Truck Trailer Manufacturer Association's supplemental petition for reconsideration and a stay of the EPA and NHTSA final rule titled "Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2." A copy of this petition has been electronically mailed to the Office of Air and Radiation Docket Center for filing in Docket No. EPA-HQ-OAR-2014-0827 and has been mailed to NHTSA's Docket Operations office for filing in Docket No. NHTSA-2014-0132.

Please contact me if you have any questions.

Sincerely,

Jonathan S. Martel

Enclosure

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BEFORE THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY AND THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

In re: Greenhouse Gas Emissions	}
and Fuel Efficiency Standards for	}
Medium- and Heavy-Duty Engines	}
and Vehicles - Phase 2	}
	}

SUPPLEMENT TO PETITION FOR RECONSIDERATION AND STAY

Pursuant to Section 307(d)(7)(B) of the Clean Air Act ("CAA")[1] and Sections 553 and 705 of the Administrative Procedure Act ("APA"),[2] the Truck Trailer Manufacturers Association, Inc. ("TTMA") hereby supplements its April 3, 2017 request[3] that the U.S. Environmental Protection Agency ("EPA") and National Highway Traffic Safety Administration ("NHTSA") (collectively, the "Agencies") reconsider and rescind the greenhouse gas ("GHG") and fuel economy standards applicable to heavy-duty truck trailers, as promulgated in the final rule entitled *Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2*, 81 Fed. Reg. 73,478 (Oct. 25, 2016) ("Final Rule"). TTMA further requests in the interim that EPA stay the implementation date of the new GHG standards applicable to trailers, currently set for January 1, 2018.

This is the first time that EPA and NHTSA have sought to impose emissions and fuel economy standards on trailers, which by design are pulled by another vehicle and therefore emit no GHGs and consume no fuel. The Agencies should rescind these standards for the simple reason that they lack legal authority to adopt such standards. The Clean Air Act authorizes EPA to regulate "motor vehicles," expressly defined as vehicles that are "self-propelled." A trailer is not self-propelled. The rationale EPA offered in the Final Rule—that trailers may be regulated as "incomplete vehicles"— reads the definition of "motor vehicle" out of the statute. A "motor vehicle" that is "incomplete" because it is not "self-propelled" and requires a tractor to pull it is not a motor vehicle. Likewise, the Energy Independence and Security Act extends NHTSA's fuel economy regulatory authority to "commercial medium- and heavy-duty on-highway vehicle[s]," defined to mean "an on-highway vehicle with a GVWR of 10,000 lbs or more." GVWR, or gross *vehicle* weight rating, is the maximum load that can be carried by a vehicle,

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[1] 42 U.S.C. § 7407.

[2] 5 U.S.C. §§ 553(e), 705.

[3] On April 3, 2017, TTMA sent a letter to EPA Administrator Scott Pruitt and Department of Transportation ("DOT") Secretary Elaine Chao requesting that the Agencies reconsider and rescind the GHG standards applicable to trailers. TTMA resubmitted the April 3 letter to EPA on April 13, 2017 in response to EPA's Request for Comment on regulations that may be appropriate for repeal, replacement, or modification under Executive Order 13777, "Enforcing the Regulatory Reform Agenda." *See* 82 Fed. Reg. 17,793 (Apr. 13, 2017). On June 1, 2017, TTMA sent a similar request to Jeffrey Rosen, DOT Regulatory Reform Officer, following his appointment to the position of Chairman of the DOT Regulatory Reform Task Force.

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including the weight of the vehicle. Heavy-duty vehicles also have a gross *combined* weight rating (GCWR), which describes the maximum load that the vehicle can haul, including the weight of a loaded trailer. The vehicles subject to NHTSA's fuel economy authority, defined by reference to GVWR, therefore exclude trailers, and TTMA fully anticipates that the D.C. Circuit would reject a theory that allows administrative agencies unilaterally to expand their regulatory reach to products that Congress expressly excluded from regulation. Beyond that, the trailer standards are arbitrary and capricious. The Agencies employed unrealistic assumptions about the speeds that trailers hauled by heavy-duty tractors travel. In addition, the Agencies failed properly to account for the additional weight of aerodynamic devices that in many circumstances would *increase* fuel consumption and also displace cargo, which would result in more trips and more emissions. Those additional trips also translate into more injuries and fatalities on U.S. roads in order to achieve negligible if any global climate benefits.

In short, the Agencies have offered a rationale that is unsupported by the statutory language and that vastly expands their regulatory reach to products that are not encompassed in the enabling statutes and that have never been subject to air pollution, GHG or fuel economy regulation before. The regulations that the Agencies have imposed will have irreparable and immediate harmful effects on the trailer manufacturing members of TTMA. Reconsideration and a stay are therefore warranted.

BACKGROUND

In October 2016, the Agencies promulgated a Final Rule establishing "Phase 2" GHG and fuel economy standards for on-road medium- and heavy-duty vehicles and engines. *See* 81 Fed. Reg. 73,478 (Oct. 25, 2016). The Final Rule includes standards applicable to a range of heavy-duty vehicles and engines, including combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles. *Id.* at 73,478. As relevant here, however, the Final Rule also includes, for the first time, GHG and fuel economy standards that apply directly to *trailers* that are hauled by heavy-duty tractors. *Id.* at 73,642 ("The HD Phase 2 program represents the first time CO_2 emission and fuel consumption standards have been established for manufacturers of new trailers."). Prior to the Final Rule, neither EPA nor NHTSA regulated the GHG and fuel economy impacts of trailers, instead relying on voluntary programs (such as EPA's SmartWay Program) and market incentives to encourage manufacturers to adopt aerodynamic and other technologies that, under limited operating conditions, can reduce GHG emissions and improve fuel economy from tractors when hauling trailers equipped with these technologies.

A. <u>The Trailer Standards and EPA Compliance Program</u>

The new GHG and fuel economy standards mandate that certain types of trailers manufactured after January 1, 2018 (in the case of the EPA GHG standards)[4] or January 1, 2021

[4] *See* 81 Fed. Reg. at 74,049; 40 C.F.R. § 1037.5(h)(4). Qualifying "small manufacturers," defined to include manufacturers with fewer than 1,000 employees, are not subject to the GHG manufacturing standards until January 1, 2019, although they still must register with EPA and label as "exempt" all trailers manufactured in 2018. 81 Fed. Reg. at 74,059; 40 C.F.R. § 1037.150(c).

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(in the case of the NHTSA fuel economy standards)[5] comply with specified emission limits. These emission limits are expressed in grams of carbon dioxide ("CO_2") per ton-mile[6] and gallons per 1,000 ton-miles for the GHG and fuel economy standards, respectively.[7] Of course, trailers do not themselves emit CO_2 or consume fuel for propulsion. Thus, the Final Rule requires manufacturers to calculate estimated CO_2 emissions levels and fuel consumption rates using a "compliance equation" that is specified in the regulations.[8] According to the Agencies, this compliance equation was developed using "standard" reference tractors and thus "the regulatory standards refer to the simulated emissions and fuel consumption of a standard tractor pulling the trailer being certified."[9] To meet the new emission standards, trailer manufacturers must install aerodynamic devices (such as side skirts and trailer tails), low-rolling resistance tires and automatic tire inflation systems. Depending on specific trailer designs, and as the standards tighten over time under the regulations, trailer manufacturers may also be forced to utilize lightweight materials. All of these options are assigned inputs to the compliance equation.[10]

Trailer manufacturers must perform several steps in advance of 2018 to ensure that their trailers manufactured after January 1, 2018 comply with the new EPA GHG standards. In particular, trailer manufacturers must register on-line with the EPA Verify access system, obtain a manufacturer code, and develop and submit applications for certificates of conformity,[11] although the EPA has not yet developed or implemented the procedures that allow manufacturers to make these applications and does not expect to do so until roughly the end of the summer. These steps require manufacturers to assess their trailer model lines and make plans for incorporating the mandated equipment (side skirts, trailer tails, low-rolling resistance tires, automatic tire inflation and tire pressure monitoring systems, etc.) into projected customer orders. Manufacturers also must evaluate, and in some cases test, the equipment to be installed to determine the applicable inputs for the compliance equation used to calculate GHG emissions and fuel consumption for various trailer types and configurations.[12] They must project sales for 2018 and obtain a certificate of conformity from EPA before selling any Model 2018 trailers, and then they must negotiate or re-negotiate sales orders and complete custom engineering for those trailers to incorporate the necessary equipment even if their customers would not otherwise purchase it. The manufacturers must acquire GHG inventory, train employees, and re-configure

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[5] *See* 81 Fed. Reg. at 74,238; 49 C.F.R. 535.3(d)(5)(iv) (NHTSA standards go into effect January 1, 2021 and are voluntary for model years 2018 through 2020).

[6] *See* 81 Fed. Reg. at 74,054; 40 C.F.R. § 1037.107.

[7] *See* 81 Fed. Reg. at 74,255; 49 C.F.R. § 535.5(e).

[8] *See* 81 Fed. Reg. at 74,073, 74259; 40 C.F.R. § 1037.515(a)(1); 49 C.F.R. § 535.6(e).

[9] 81 Fed. Reg. at 73,647.

[10] Under the EPA rules, for model years through 2026, trailer manufacturers may designate a limited number of trailers as exempt from the standards and certification requirements. *See* 81 Fed. Reg. at 74,060; 40 C.F.R. § 1037.150(v). As a practical matter, however, nearly all trailers will be required to meet the new GHG standards starting in 2018 (or 2019 for "small" manufacturers).

[11] *See* 81 Fed. Reg. at 74,062; 40 C.F.R. § 1037.205.

[12] *See, e.g.*, 81 Fed. Reg. at 74,081; 40 C.F.R. § 1037.526.

assembly lines to enable production, and they must develop data collection and reporting systems to ensure compliance. Trailer manufacturers would not have to incur these costs and disruptions in customer relations and manufacturing processes but for the GHG standards for trailers.

B. TTMA Petition for Review and Correspondence with the Agencies

On December 22, 2016, TTMA filed a petition for review of the Final Rule in the U.S. Court of Appeals for the D.C. Circuit on the grounds that (1) the Agencies lack statutory authority to regulate trailers with respect to GHG emissions and fuel consumption, and (2) the Final Rule, as applied to trailers, is arbitrary and capricious because, among other reasons, the Agencies utilized unrealistic assumptions in their cost/benefit analysis and failed properly to account for the additional weight and cost of aerodynamic devices, which increase fuel consumption and displace cargo, thereby resulting in more trips, more emissions, and more accidents. *See Truck Trailer Manufacturers Association v. EPA, et al.*, No. 16-1430. That litigation is pending and, as of the date of this Petition, no briefing schedule has been set.

On April 3, 2017, TTMA sent a letter to EPA Administrator Scott Pruitt and Department of Transportation ("DOT") Secretary Elaine Chao requesting that the Agencies reconsider and rescind the Phase 2 GHG and fuel economy standards applicable to trailers. TTMA resubmitted the April 3 letter to EPA on April 13, 2017 in response to EPA's Request for Comment on regulations that may be appropriate for repeal, replacement, or modification under Executive Order 13777, "Enforcing the Regulatory Reform Agenda." *See* 82 Fed. Reg. 17,793 (Apr. 13, 2017). In light of TTMA's request, the Agencies moved for a 90-day abeyance of the D.C. Circuit litigation, which the Court granted on May 8, 2017.

ISSUES MERITING RECONSIDERATION

EPA and NHTSA should reconsider the Final Rule; in fact, they are required to do so. On March 28, 2017, President Trump issued Executive Order 13777 on Promoting Energy Independence and Economic Growth. Section 3(d) of the Executive Order mandates that all agencies review and identify actions that are related to or arose from President Obama's June 2013 Climate Action Plan. The GHG and fuel economy trailer standards contained in the Final Rule are clearly within the scope of this Order, because the Final Rule is related to and arose from the 2013 Climate Action Plan. *See* Executive Office of the President, *The President's Climate Action Plan* at 8 (June 2013) (addressing increased fuel economy standards for heavy-duty vehicles); *see also* 81 Fed. Reg. at 73,480 (describing the Final Rule as having been "called for" in the 2013 Climate Action Plan). The Executive Order further directs that each agency shall, as soon as practicable, publish for notice and comment proposed rules suspending, revising, or rescinding any such actions, as appropriate and consistent with law and the policies stated in Section 1 of the Order. The Order states in its very first sentence a policy to avoid regulatory burdens that unnecessarily constrain economic growth and prevent job creation. Section 1 goes on to elaborate as policy that environmental regulations must comply with the law, have greater benefits than costs, and rely on the best available peer-reviewed science and economics. For the reasons summarized above and detailed below, the trailer requirements in the Final Rule are unlawful and conflict with these policies.

Furthermore, in seeking to justify the costs as outweighing the benefits of the Final Rule, the Agencies relied on the Obama Administration's "social cost of carbon." *See* 81 Fed. Reg. at 73875 (explaining that the Agencies "estimate the global social benefits of CO_2 emission reductions expected from the heavy-duty GHG and fuel efficiency standards using the social cost of carbon"). The March 28 Executive Order directed that the prior Administration's social cost of carbon analyses be withdrawn, and that, effective immediately, agencies shall ensure that estimates used in valuing the GHG impacts of regulations be consistent with OMB Circular A-4 (Sept. 17, 2003). The Order specifically directed that this include considering the societal benefits of reducing carbon in the United States but not the rest of the world, and a different approach to considering the appropriate discount rates. Accordingly, the Order directs a new approach, effective immediately, that is different from and in conflict with the approach the Agencies used to justify the Final Rule, including the trailer standards. The Order makes clear that the Agencies' approach is "no longer representative of government policy." Not only does this constitute a further policy reason to revisit the trailer requirements, but it constitutes centrally relevant new information requiring reconsideration of the rule under Section 307(d)(7)(B) of the Clean Air Act, 42 U.S.C. § 7607(d)(7)(B). Indeed, such reconsideration is especially acute here, where the Agencies judged the requirements as worthwhile after weighing benefits of reducing carbon—including such benefits outside of the United States—against costs that include an increase in traffic accidents and several additional highway fatalities in the United States.

REQUEST FOR CAA 307(D) STAY PENDING RECONSIDERATION

Section 307(d)(7)(B) of the CAA authorizes EPA to stay the effectiveness of a rule that it is reconsidering "for a period not to exceed three months." 42 U.S.C. § 7607(d)(7)(B). Such a stay gives the Agency time to reconsider its position and review the rule's requirements without imposing unnecessary compliance costs on regulated entities. EPA also may use a section 307(d) stay to avoid any confusion caused by the Agency implementing and then subsequently revising its regulatory requirements. Staying—or, in this case, extending—the implementation date of the new GHG standards for trailers until EPA completes its reconsideration process thus avoids the otherwise imminent compliance burdens and uncertainty for the regulated industry.

TTMA respectfully requests that EPA exercise its authority under the CAA to stay the effectiveness of the GHG standards for trailers pending reconsideration to the fullest extent permissible by the Clean Air Act. The Final Rule imposes imminent and substantial compliance obligations on trailer manufacturers that have more than 1,000 employees. The new GHG standards for trailers require compliance by TTMA's members beginning January 1, 2018. *See* 81 Fed. Reg. at 74049; 40 C.F.R. § 1037.5(h)(4). For 2018 trailer production, these new GHG standards will mandate installation of side skirts, trailer tails, low rolling resistance tires, and tire pressure inflation/monitoring systems on nearly all trailers manufactured and sold in the United States by TTMA's members.[13] As explained in more detail below, trailer manufacturers must

[13] As noted, qualifying small manufacturers are exempt from the GHG manufacturing standards until January 1, 2019, although they must still register with EPA and label their 2018 Model trailers as exempt. *See* 81 Fed. Reg. at 74,059; 40 C.F.R. § 1037.150(c). Other manufacturers

Footnote continued on next page

take steps well before January 1, 2018 to comply with these new EPA requirements. Staying the rule during reconsideration—by extending the January 1, 2018 implementation date for the EPA trailer standards —will avoid imposing these compliance costs prematurely and avoid confusion and disruption among the regulated industry. In short, a stay would afford EPA the time necessary fully to reconsider the Final Rule without adversely affecting the regulated industry.

REQUEST FOR APA 705 STAY PENDING JUDICIAL REVIEW

In addition to this petition for reconsideration, TTMA has filed a petition for review in the U.S. Court of Appeals for the D.C. Circuit challenging the Final Rule on the grounds that the new GHG and fuel economy standards applicable to trailers exceed the scope of EPA and NHTSA's statutory authorities and the Agencies did not adequately consider costs or properly assess benefits when promulgating these new standards. While judicial review is pending, Section 705 of the APA allows EPA to stay the effective date of a final rule if it "finds that justice so requires." 5 U.S.C. § 705. TTMA requests that EPA make such a finding here.

Both EPA and the courts have applied a four-part test to determine whether "justice so requires" a stay of agency action pending judicial review. Under that test, the Agency must consider: (1) whether there is a likelihood of success on the merits of the judicial challenge, (2) irreparable harm to the moving party if the stay is not granted, (3) the potential for harm to others if the stay is granted, and (4) whether the public interest weighs in favor of granting the stay. *Sierra Club v. Jackson*, 833 F. Supp. 2d 11, 30 (D.D.C. 2012). As explained below, each of these factors weighs in favor of staying this Final Rule as applied to trailers until the resolution of judicial review.

A. TTMA's Challenge is Likely to Succeed on the Merits

The TTMA's petition for review is likely to succeed on the merits. Principally, the Clean Air Act makes manifestly clear that EPA lacks authority to regulate trailers. Even if EPA had such authority, the rule would be invalid because it is arbitrary and capricious.

1. EPA Lacks Authority To Regulate Trailers

EPA claims that it has authority to regulate trailers under Section 202 of the Clean Air Act, which authorizes EPA to prescribe "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines ..., whether such vehicles and engines are designed as complete systems or incorporate devices to prevent or control such pollution." 42 U.S.C. § 7521(a)(1). But the Act defines the term "motor vehicle" to mean "any self-propelled vehicle designed for transporting persons or property on a street or highway." *Id.* § 7550(2). It is undisputed that a trailer is not self-propelled. That should be the end of the matter. If a trailer is not self-propelled, it is not a motor vehicle under § 7550(2), and the EPA may not regulate it under § 7521(a)(1).

Footnote continued from previous page
can exempt up to 20 percent of their annual production, subject to caps of 350 units for box van trailers and 250 units for non-box trailers. *See* 81 Fed. Reg. at 74,060; 40 C.F.R. § 1037.150(v).

In the Final Rule, EPA argues that a trailer is something called an "incomplete vehicle," a term that appears nowhere in the Clean Air Act. EPA argues that it can regulate "incomplete vehicles" because the Act applies "whether [motor vehicles] and [motor vehicle] engines are designed as complete systems or incorporate devices to prevent or control such pollution." § 7521(a)(1). This statutory language does just what it says: it provides authority to regulate motor vehicles or engines that are not complete *systems*, in the sense that they incorporate pollution-controlling devices. But a vehicle that is not "designed as [a] complete system[]" because it contains a pollution-controlling device is nonetheless self-propelled, and it is still a motor vehicle. The Act's grant of regulatory power over motor vehicles that incorporate pollution-controlling devices does not somehow implicitly signal that EPA also can regulate products that are *not* motor vehicles. Indeed, if EPA's analysis were correct, the phrase "motor vehicle engine" in § 7521(a)(1) would be entirely superfluous. After all, under EPA's theory, an engine is as much an "incomplete vehicle" as a trailer. If Congress had intended to authorize the regulation of "incomplete vehicles" in a manner that would encompass trailers, the statute would have said so.

The Final Rule describes three other statutory provisions as "incomplete vehicle provisions," 81 Fed. Reg. 73,514, but the provisions each expressly require that "motor vehicles" meet specified requirements, rather than imposing requirements on components. *See* § 7521(a)(6) (EPA must require that "new light-duty vehicles ... be equipped with" onboard vapor recovery systems); § 7521(a)(5)(A) ("fill pipe standards for new motor vehicles"); § 7521(k) (regulations "applicable to evaporative emissions of hydrocarbons from all gasoline-fueled motor vehicles"). EPA's statement that these provisions concern "incomplete vehicles" is puzzling at best. Of course regulating a "motor vehicle" may *impact* or even necessitate additional components or parts of that vehicle, but no normal speaker of English would conclude that, for example, a provision requiring a vehicle to contain an onboard vapor recovery system constitutes a regulation of an "incomplete vehicle." But it is academic in any event. If EPA is correct that the Act contains specific provisions targeted at specific types of equipment that are not "motor vehicles" but rather "incomplete vehicles," that only confirms that the grant of authority in § 7521(a) does not extend generally to *anything* the EPA might term an "incomplete vehicle."

Even if EPA could regulate an "incomplete vehicle" under the convoluted theory that § 7521(a) refers to "systems" that are not "complete," a trailer would not qualify. A trailer may sometimes be attached to a tractor, but that no more makes it an "incomplete vehicle" than a wagon is an "incomplete horse." The term "incomplete" means "lacking a usually necessary part, element, or step."[14] A trailer is not a "necessary part" of a vehicle, and obviously is not "necessary" for purposes of self-propulsion, which is the defining feature of the term "motor vehicle" in the Clean Air Act. Trailers are manufactured and sold separately to different ultimate purchasers from tractors, and the same trailers are routinely attached to and hauled by many different tractors over the course of their useful life. Each tractor likewise hauls many different trailers. A particular tractor-trailer combination is thus in no sense a single motor vehicle. In fact, the EPA itself in previous rulemakings has made clear its interpretation that that trailers are

[14] https://www.merriam-webster.com/dictionary/incomplete

not vehicles, incomplete or otherwise; instead, the tractor is the vehicle, and the trailer is not. *E.g.*, 76 Fed. Reg. 57,106, 57,114 (Sept. 15, 2011) (explaining that "gross combined weight rating ... describes the maximum load that the vehicle can haul, including the weight of a loaded trailer *and the vehicle itself*") (emphasis added).

Indeed, the United States government has repeatedly and successfully taken the common-sense position that a trailer is not a vehicle for purposes of federal criminal laws precisely because it is not "self-propelled," *see* 18 U.S.C. § 2311, and that this *does not change* when the trailer is attached to the truck. This theory that a trailer attached to a tractor is not a vehicle has enabled the government to charge individuals who steal a combination tractor-trailer with two crimes—stealing a vehicle (the tractor) and stealing a "good" (the trailer)—and obtain consecutive sentences. *E.g.*, *Bernard v. United States*, 872 F.2d 376, 377 (11th Cir. 1989); *United States v. Lofty*, 455 F.2d 506, 506 (4th Cir. 1972); *United States v. Kidding*, 560 F.2d 1303, 1308 (7th Cir. 1977). As the Seventh Circuit explained in adopting the United States' argument in that context, "[c]learly a trailer, if it stands alone, is not a motor vehicle," and the combination of the trailer and tractor does not change that result, because the "trailer was not indispensable to making the tractor a 'vehicle.'" *Id.*

EPA's theory that Congress silently authorized the regulation of trailers via § 7521(a)(1)'s "complete systems" language is also irreconcilable with the language of numerous other federal statutes that define the term "motor vehicle" to reach trailers expressly. *E.g.*, 40 U.S.C. § 17101(2) ("'motor vehicle' means a vehicle, self-propelled or drawn by mechanical power..."); 40 U.S.C. § 17501(2) ("'motor vehicle means ... a vehicle self-propelled or drawn by mechanical power"); 18 U.S.C. § 31(a)(6) ("'motor vehicle' means every description of carriage or other contrivance propelled or drawn by mechanical power"); 49 U.S.C. § 30102(7) ("'motor vehicle' means a vehicle driven or drawn by mechanical power ..."); 49 U.S.C. 32101(7) (same); 49 U.S.C. § 30301 ("'motor vehicle' means a vehicle, machine, tractor, trailer, or semitrailer propelled or drawn by mechanical power"). Congress "knew how to provide for" regulation of trailers, *Meghrig v. KFC Western, Inc.*, 516 U.S. 479, 485 (1996), and its omission of language like "drawn by mechanical power" in the Clean Air Act confirms that it did not intend to do so here.

Finally, the "incomplete vehicle" theory would render EPA's regulatory authority essentially limitless. EPA protests that interpreting § 7521(a)(1) to cover "incomplete vehicles" "is not to say that the Act authorizes emission standards for any part of a motor vehicle, however insignificant." 81 Fed. Reg. 73514. But under EPA's interpretation in the Final Rule, the Act *does* authorize the EPA to set emissions standards for any part of a motor vehicle. Nothing in the Act provides any basis upon which to distinguish between a trailer and any other component; there is no "intelligible principle" contained within the Act itself. *Mistretta v. United States*, 488 U.S. 361, 372 (1989). The Final Rule announces that a trailer "properly fall[s] on the vehicle side of the line," 81 Fed. Reg. 73515, but this is just ipse dixit. The absence of any "intelligible principle" in the Act that sets the limits of EPA's authority to decide what constitutes an "incomplete vehicle" is a strong indication that the Act does not in fact permit regulation of an

"incomplete vehicle." Indeed, if EPA's interpretation were correct, the Act would be unconstitutional under the nondelegation doctrine. *Mistretta*, 488 U.S. at 372.[15]

At bottom, EPA's "incomplete vehicle" theory would vastly expand its regulatory reach to equipment that Congress expressly excluded from regulation, namely, equipment that is not self-propelled. Dubbing something an "incomplete vehicle" is just another way of saying that it is *not* a vehicle. EPA's argument is highly unlikely to succeed on the merits.

2. The Rules are Arbitrary and Capricious

Even if EPA did have authority under the Clean Air Act to regulate trailers—and it does not—the trailer standards are arbitrary and capricious.

First, the Agencies overstated the GHG and fuel economy benefits of the trailer standards by using unrealistic and unsupported assumptions regarding the speeds at which trailers hauled by heavy-duty tractors travel. The Agencies projected GHG and fuel economy benefits from, among other things, drag reduction achieved by aerodynamic devices, which is primarily a function of vehicle speed.[16] In performing their analysis, the Agencies used drive cycle weightings from the Phase 1 heavy-duty vehicle rule to characterize the percentage of vehicle miles traveled at certain speeds—below 55 miles per hour ("mph"), between 55 and 65 mph, and above 65 mph—by different types of trailers.[17] Those drive cycle weightings, however, are not supported by the underlying data. In fact, although the Agencies characterized the percentage of vehicle miles traveled at speeds exceeding 65 mph, not one of the studies upon which the Agencies relied actually included a "greater than 65 mph" speed category.

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[15] TTMA has also petitioned for review of the fuel economy standards in the Final Rule, on the ground that NHTSA too lacked authority to regulate trailers. The Energy Independence and Security Act, which authorized NHTSA's participation in the rulemaking, applies to "commercial medium- and heavy-duty on-highway vehicle[s]," 49 U.S.C. § 32902(k)(2), and defines that term to mean "an on-highway vehicle with a GVWR of 10,000 lbs or more," *id.* § 32901(a)(7). That definition excludes a trailer. As EPA has recognized in prior rulemakings: "GVWR describes the maximum load that can be carried by a vehicle, including the weight of the vehicle itself. Heavy-duty vehicles also have a gross combined weight rating (GCWR), which describes the maximum load that the vehicle can haul, including the weight of a loaded trailer and the vehicle itself." 76 Fed. Reg. 57,106, 57,114 (Sept. 15, 2011). Congress's reference to GVWR thus excludes trailers as a textual matter. However, because TTMA is only seeking a stay of the emissions standards promulgated by the EPA because NHTSA's mandatory standards do not take effect until January 1, 2021, there is no need to consider the TTMA's likelihood of success on its challenge to NHTSA's authority at this time.

[16] Speed matters exponentially, as the basic drag equation uses velocity *squared.* Adding another 5 miles per hour to 50 mph input data produces a result much greater than a 10% increase. Reductions in drag calculated for aerodynamic equipment on trailers that are assumed to operate at higher than actual speeds will similarly overstate benefits.

[17] EPA/NHTSA, Response to Comments for Joint Rulemaking, EPA-420-R-16-901, at 1030-31 (Aug. 2016).

The Agencies assumed that long (53-foot) dry-freight and refrigerated vans are operated at speeds exceeding 65 mph for 86 percent of the vehicle miles traveled and at speeds between 55 and 65 mph for 9 percent of the vehicle miles traveled.[18] The Agencies further assumed that short dry-freight and refrigerated vans are operated at speeds exceeding 65 mph for 64 percent of the vehicle miles traveled and at speeds between 55 and 65 mph for 17 percent of the vehicle miles traveled.[19] The Agencies explained that these ranges were derived from three studies: (1) an EPA MOVES analysis of Federal Highway Administration data from 1999; (2) a University of California Riverside (UCR) evaluation in 2006 of data from 270 trucks; and (3) an Oak Ridge National Laboratory study of a fleet of six trucks published in 2009.[20] Critically, however, not one of these studies included a "greater than 65 mph" speed category—the EPA MOVES and Oak Ridge analyses reported the fraction of vehicle miles traveled at speeds exceeding 60 mph, and the UCR analysis reported the fraction of vehicle miles traveled at speeds exceeding 45 mph.[21] Moreover, the actual percentages used by the Agencies (86 and 9 percent for long van trailers and 64 and 17 percent for short van trailers) come directly from the EPA MOVES analysis. But the speed ranges reported in the EPA MOVES analysis were actually five mph slower—greater than 60 mph and 50 to 60 mph, respectively.[22] In other words, the Agencies assumed that long van trailers travel at speeds exceeding **55** mph for 95 percent of the vehicle miles traveled based solely on data reporting that such trailers travel at speeds exceeding **50** mph for 95 percent of the vehicle miles traveled. Simply put, the Agencies selected the highest percentages for miles traveled from only one of the three cited data sources, in effect ignoring the other two, and then inflated the speed threshold for those miles traveled. As a consequence, the Agencies' own data do not support the speed distribution ranges they used to evaluate the purported benefits of the trailer standards, thus rendering those standards themselves arbitrary and capricious.[23]

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[18] *See* 81 Fed. Reg. at 73,654.

[19] *Id.*

[20] EPA/NHTSA, Response to Comments for Joint Rulemaking, EPA-420-R-16-901, at 1030 (Aug. 2016).

[21] *Id.* at 1031 (Table 3-14).

[22] *Id.*

[23] Moreover, even if the Agencies accurately characterized the data from the EPA MOVES analysis, those data are not representative of real-world operation. The EPA MOVES data for long van trailers, for example, were recorded on "restricted access" highways. EPA/NHTSA, Response to Comments for Joint Rulemaking, EPA-420-R-16-901, at 1030 (Aug. 2016). Long van trailers are operated on all types of highways, not just those with restricted access. In fact, most non-restricted rural highways do not even allow speeds in excess of 65 mph. Utility Trailer Manufacturing Company ("Utility") submitted data from three long-haul trucking fleets that more accurately reflect real-world operation. Comments of Utility Trailer Manufacturing Co., EPA-HQ-OAR-2014-0827-1183, at 4-7. The Agencies erroneously concluded that "the fleet data provided by Utility is not substantially different than the current GEM drive cycle weightings." Memorandum to Docket EPA-HQ-OAR-2014-0827, "Comparison of GEM Drive Cycle Weightings and Fleet Data Provided by Utility Trailer Manufacturing Co. in Public Comments" (July 2016). The record does not support that conclusion. Whereas the Agencies

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Second, the Agencies failed to account fully for the additional weight of aerodynamic devices, which increase fuel consumption and displace cargo, resulting in more trips, more emissions, and more accidents. As described above, the GHG trailer standards will mandate that trailer manufacturers install side skirts and trailer tails, among other devices, on nearly all of the trailers they manufacture. Side skirts add, on average, about 250 pounds to the weight of a typical 53-foot trailer, and trailer tails add an additional 150 pounds.[24] The Agencies attempted to evaluate the impact of additional vehicle weight due to the use of aerodynamic devices,[25] but failed to address the effect of cargo displacement. Because motor carriers must operate below an 80,000-pound maximum weight limit for the tractor, trailer and cargo combined,[26] the addition of side skirts and tails would cause some trucks to "weigh-out." Consequently, motor carriers will have to shift cargo from some of their trucks, resulting in additional trips to transport freight that could not be moved by the "weighed-out" trucks. TTMA estimates that these additional trips would cause an additional 184 million truck miles traveled per year, resulting in additional emissions as well as 246 more accidents and 7 additional fatal crashes per year.[27]

In response to these concerns, the Agencies summarily explained that the additional weight from aerodynamic devices "can easily be offset by substituting lightweight components" elsewhere in the trailer designs.[28] This response is not sufficient. Motor carriers already demand that trailers weigh and cost as little as possible while still being capable of carrying the expected freight loads`. Lighter-weight alternative materials (such as aluminum) are considerably more expensive than standard materials (such as steel), and often are not desired by customers. The Agencies' unreasonably assume that trailer manufacturers required to add several hundred pounds of aerodynamic equipment to their trailers will voluntarily offset that weight by installing more expensive, light-weight technologies. If the cost of the light-weight material is not worthwhile to customers in the first instance to make room for more cargo, there is no reason to believe that they will be willing to bear that additional cost to make room for more cargo just

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determined that long van trailers travel at speeds exceeding 55 mph for 95 percent of the vehicle miles traveled, Utility's data show that such trailers travel at speeds exceeding 55 mph for only 84 percent of the vehicle miles traveled—a difference of 11 percentage points. *Id.* at 2. The Agencies' decision to disregard the real-world fleet data submitted by Utility was arbitrary and capricious.

[24] *See* Comments of Truck Trailer Manufacturers Association, EPA-HQ-OAR-2014-0827-1172-A1, at 7-8.

[25] *See* Memorandum to Docket EPA-HQ-OAR-2014-0827, "Impact of Additional Weight Due to Trailer Aerodynamic Devices" (July 18, 2016).

[26] *See* 23 CFR § 658.17(b).

[27] *See* Comments of Truck Trailer Manufacturers Association, EPA-HQ-OAR-2014-0827-1172-A1, at 7-8. The Agencies disagree with certain of TTMA's assumptions and conclude that the additional truck miles will result in an increase of about three fatalities per year. EPA/NHTSA, Response to Comments for Joint Rulemaking, EPA-420-R-16-901, at 1019 (Aug. 2016).

[28] EPA/NHTSA, Response to Comments for Joint Rulemaking, EPA-420-R-16-901, at 1016 (Aug. 2016).

because the total cargo capacity is reduced by the aerodynamic equipment. In fact, the aerodynamic equipment consumes weight and cargo capacity, which will inexorably lead to more (and heavier) trucks in the U.S. fleet to carry the same total cargo, with the additional trucks emitting additional pollutants, adding to total truck miles traveled, and causing more accidents, injuries and fatalities.

B. TTMA's Members Will Suffer Irreparable Harm

TTMA's members face a substantial loss of business, market share, and goodwill as a consequence of the regulations, as well as irreparable compliance costs. Although the GHG regulations take effect on January 1, 2018, TTMA's members face these harms imminently. Trailers are manufactured to each customer's unique specifications, and new orders must be placed about six months in advance of actual production. Accordingly, TTMA members' customers are putting in orders for delivery in January 2018 beginning now, in June 2017.

To be in a position to produce trailers that are compliant with the GHG regulations by January 2018, TTMA's members must make far-reaching and costly changes to their business, starting now. They must identify component suppliers for the required equipment, evaluate and, where necessary, test that equipment, revise pricing and trailer option books and train sales representatives to explain the compliant option combinations to customers, add manufacturing floor space and reconfigure assembly lines, train production employees to install the new GHG equipment, and develop data collection and reporting systems to ensure compliance. One TTMA member, for example, estimates that it will incur over $7.5 million in costs in 2017-2018 simply to provide inventory storage areas, transport the GHG equipment to its plants, modify plant facilities to enable installation of this equipment on trailers as part of its assembly lines, and secure trained employees to install the new GHG equipment on the requisite number of trailers. That figure omits costs for engineering work to evaluate all possible trailer configurations for compatibility with the new GHG regulations, the cost of administrative work needed to apply for certification and operate a compliance program, and the cost of the GHG equipment itself, and the business disruption and significant loss of efficiency while changes are made to production lines, supply chains, manufacturing protocols, and storage options. Other manufacturers, depending on their size, anticipate spending between $300,000 and $6.3 million in 2017-2018 on developing compliance systems and procuring and installing GHG equipment. In addition, TTMA estimates that the material and delivery costs of purchasing the new GHG equipment will exceed $100 million annually. Even EPA assumes that its new regulations will create substantial compliance costs, including redesign, re-engineering, and identifying new suppliers.

These compliance costs qualify as irreparable harm. "[C]omplying with a regulation later held invalid almost always produces the irreparable harm of nonrecoverable compliance costs." *Texas v. United States Envtl. Prot. Agency*, 829 F.3d 405, 433 (5th Cir. 2016) (quoting *Thunder Basin Coal Co. v. Reich*, 510 U.S. 200, 220–21, 114 S.Ct. 771, 127 L.Ed.2d 29 (1994) (Scalia, J., concurring in part and in the judgment)). For example, being forced to undertake "difficult, time-consuming, and expensive safety testing regarding the safety … of their products" and to spend "more time and significantly more money" in development is irreparable harm that "can never be recouped." *Bracco Diagnostics, Inc. v. Shalala*, 963 F. Supp. 20, 28-29 (D.D.C. 1997). No matter what, TTMA's members will "be forced to incur large costs which, if [they] manage[]

to survive those, will disrupt and change the whole nature of [their] business in ways that most likely cannot be compensated with damages alone." *Am. Trucking Associations, Inc. v. City of Los Angeles*, 559 F.3d 1046, 1058 (9th Cir. 2009) (finding irreparable harm where companies would be forced to begin complying with a regulation they alleged was preempted); *see also Portland Cement Ass'n v. E.P.A.*, 665 F.3d 177, 189 (D.C. Cir. 2011) (staying portion of EPA rule because "industry should not have to build expensive new containment structures until the standard is finally determined"). TTMA's members have no mechanism to recover these costs from the government if the GHG regulations are later held to be invalid.

Beyond compliance costs, TTMA's members also face an irreparable loss of business relationships, market share, and goodwill. As noted, motor carriers who wish to purchase trailers equipped with side-skirts and other fuel-saving devices are already doing so; other carriers have concluded that purchasing these trailers makes no economic sense for their trucking operations. Because TTMA's members must begin accepting orders six months ahead of delivery, most of TTMA's members are now required to quote only compliant products to prospective customers, most of whom have so far not wanted this added equipment. Those customers will look to other trailer manufacturers who can offer exempt trailers. Preventing companies from delivering their products to customers "almost inevitably creates irreparable damage to … good will." *Reuters Ltd. v. UPI, Inc.*, 903 F.2d 904, 908 (2d Cir. 1990); *id.* at 909 ("irreparable harm has often consisted of the loss of customers and the competitive disadvantage that resulted from a distributor's inability to supply its customers with the terminated product"); *Register.com, Inc. v. Verio, Inc.*, 356 F.3d 393, 404 (2d Cir. 2004) ("irreparable harm through loss of reputation, good will, and business opportunities"). The harm is especially irreparable here because not all trailer manufacturers are subject to the new regulations. Smaller manufacturers need not begin selling and installing GHG-control equipment until 2019, which means they are currently free to accept orders without the unwanted and expensive equipment. In other words, some of TTMA's members face an imminent risk of loss of market share because, as a consequence of the new rules, their customers will *only* be able to purchase the products they prefer from other manufacturers. "It is well-established that a movant's loss of current or future market share may constitute irreparable harm." *Grand River Enter. Six Nations, Ltd. v. Pryor*, 481 F.3d 60, 67 (2d Cir. 2007); *Freedom Holdings, Inc. v. Spitzer*, 408 F.3d 112, 114 (2d Cir. 2005). "In a competitive industry where consumers are brand-loyal, we believe that loss of market share is a 'potential harm which cannot be redressed by a legal or an equitable remedy following a trial.'" *Novartis Consumer Health, Inc. v. Johnson & Johnson-Merck Consumer Pharm.*, 290 F.3d 578, 596 (3d Cir. 2002).

C. <u>No Third Parties Will Be Harmed If There is A Stay</u>

Granting a temporary stay of the trailer standards would not cause harm to third parties because the trailer standards, even if implemented, would achieve little if any benefit to global climate change. This is because trailer manufacturers *already* install and sell the mandated technologies where those technologies are most likely to improve fuel economy and thereby reduce GHG emissions. The motor carrier industry is an extremely competitive, low-margin industry that is particularly sensitive to fuel costs and trailer weight (which impacts the amount of cargo the tractor-trailer combination can haul in light of the 80,000-pound weight limit). Consequently, motor carrier customers already pressure their trailer manufacturer suppliers to

install low-rolling resistance tires and aerodynamic equipment where the nature of their trucking operations will enable them to realize measureable fuel savings, and to reduce trailer weight where cost-effective to enable them to haul additional cargo.

Thus, because trailers are used in a variety of applications, trailer manufacturers must customize the trailers they manufacture and sell to meet their customers' specific needs. Market forces already dictate that trailer manufacturers install and sell technologies designed to reduce aerodynamic drag and road friction for applications in which such technologies are likely to materially improve fuel economy (and thus GHG emissions performance). For trailers used in long-haul applications, for example—where the tractor-trailer combination will travel long distances at high speeds—these technologies can have a significant impact on fuel consumption. A customer operating a truck fleet engaged in long-haul operations thus has a significant incentive to demand aerodynamic and friction-reducing technologies on its trailers to reduce overall fuel costs.

In contrast, aerodynamic and friction-reducing technologies do not materially reduce fuel consumption or GHG emissions during short-haul operations at lower speeds (*e.g.*, in-city deliveries, food service, etc.). For these applications, customers typically do not request, and trailer manufacturers do not install, aerodynamic and friction-reducing technologies because the costs of doing so significantly outweigh any potential benefits. The trailer standards, however, would mandate that trailer manufacturers install and sell these technologies on nearly all heavy-duty trailers, including those designated for short-haul operations. The trailer standards thus create compliance costs for trailer manufacturers and their customers without providing corresponding fuel economy or GHG benefits to third parties and the environment. Indeed, the added weight of the aerodynamic equipment in those operations will cause *greater* fuel consumption and *increased* GHG emissions.

In short, because the trailer standards provide no demonstrable benefit to third parties or the environment beyond what the trailer industry already is achieving due to market forces, this factor weighs in favor of granting a stay.

D. A Stay is In the Public Interest

Staying the effective date of the Final Rule's trailer standards also is in the public interest. If the trailer standards remain in effect during the pendency of judicial review, they will impose substantial compliance costs on regulated entities that cannot be recouped, without providing any material benefit to the general public or the environment. As addressed above, trailer manufacturers already install and sell aerodynamic and friction-reducing technologies where such technologies are likely to achieve GHG and fuel economy benefits. The Agencies have not demonstrated that mandating trailer manufacturers to install and sell such technologies on additional trailers—beyond what the trailer industry already is doing—will benefit the public. Indeed, as described above, the new trailer standards actually will have the opposite effect —they will needlessly force manufacturers to add heavy aerodynamic devices to their trailers, thereby displacing cargo and resulting in more trips to deliver the same amount of cargo, leading to increased fuel consumption, increased emissions, and increased trucking accidents in the United States. With negligible benefits for global climate change even when calculated by the

Agencies on a global basis, the American public must bear these additional costs and indeed at least several additional fatalities due to the need for more trucks on the Nation's roads to carry the same total cargo. This is contrary to the interest of the American public.

CONCLUSION

In sum, EPA and NHTSA should reconsider and rescind the GHG and fuel economy standards for heavy-duty truck trailers because such trailers are not motor vehicles and so the agencies lack authority impose such regulations on them. Even if the agencies did have such authority, they should reconsider and rescind these regulations because they arbitrarily impose requirements without properly considering whether additional aerodynamic equipment is productive at the speeds these trailers are hauled or the additional weight of such equipment that displaces cargo that must then be carried by additional trailers. Finally, EPA should immediately stay the effect of its GHG requirements for trailers, which are causing immediate and irreparable harm as trailer manufacturers must now take steps to comply with these rules for Model Year 2018.

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From: Jones, Gary
Sent: Fri 6/23/2017 7:58:57 PM
Subject: Follow Up From This Week's Meeting With NAM
PrintSTEPevaluationreport082506.pdf

Samantha and Brittany:

It was a pleasure to meet both of you at this week's meeting hosted by NAM. One of the action items I had from the meeting was to provide you with information on the project we completed under EPA's Common Sense Initiative, the PrintSTEP Program, short for the Printers' Simplified Total Environmental Partnership. I have attached the evaluation report prepared by EPA which provides more details about the program and its successes.

As a brief introduction, the PrintSTEP concept was developed by a diverse group of stakeholders including EPA, industry, state, labor, environmental groups, and environmental justice representatives. Under PrintSTEP, printers voluntarily enter into a single enforceable agreement with their state environmental agency, having one central agency contact with whom the printers interact. PrintSTEP includes the requirements for waste water, hazardous waste, storm water, and air emissions that are all covered in one multi-media agreement with the state. PrintSTEP does not change the existing environmental emissions or release standards. Instead, it changes the process of implementing those standards to improve efficiency and environmental performance. PrintSTEP provides operational flexibility for the printing operation and reduces or eliminates agency interactions when changes in operations occur.

In order to test the PrintSTEP concept, it was piloted in New Hampshire and Missouri. In New Hampshire, the pilot was state-wide, while in Missouri, it focused on St. Louis.

The PrintSTEP program was modeled after an existing program that was initiated in Massachusetts called the Environmental Results Program, which has been very successful. We are currently working with the Wisconsin Department of Natural Resources to implement an Environmental Results program based on the Massachusetts program and PrintSTEP. It was already piloted in Wisconsin and our project is focusing on making it permanent as is the situation in Massachusetts.

I will follow up with you in a week or so to see if you have any other questions about the report or what we are seeking to achieve in Wisconsin.

Sincerely,

Gary Jones

Assistant Vice President, EHS Affairs

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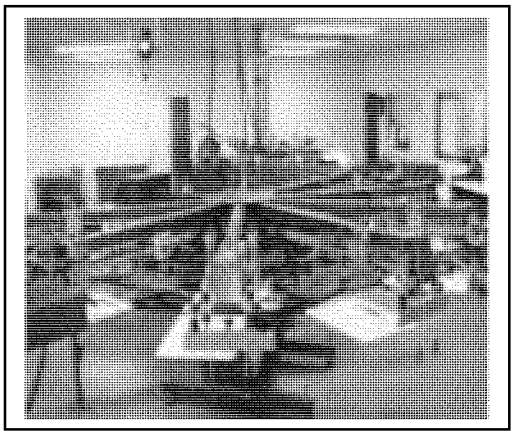
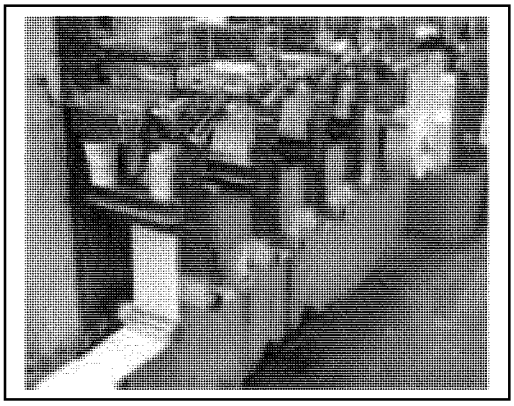
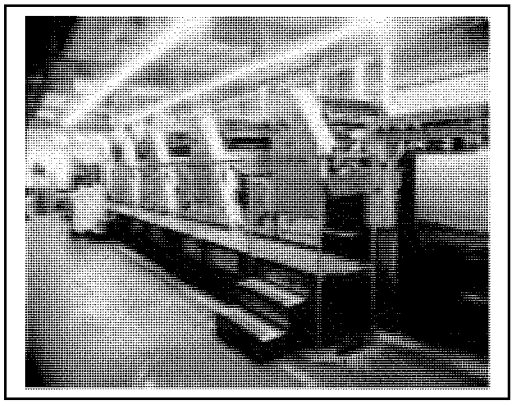
Evaluation of the PrintSTEP Pilot Program

August 16, 2006







Acknowledgements

This report was prepared by Abt Associates Inc., Cambridge, MA for the U.S. Environmental Protection Agency's Office of Compliance, led by Michael Stahl, under contract number GS-10F-0146; Order #3W-2942-NBLX. The EPA project manager was Maureen Lydon. The PrintSTEP project manager and the national stakeholder group provided extensive input, comments and ongoing support throughout the preparation of the report. The stakeholders who commented extensively included: Gary Jones of Printing Industries of America/Graphic Arts Technical Foundation; Marci Kinter of Specialty Graphic Imaging Association; Tara Olson and Rudy Cartier of New Hampshire Department of Environmental Services; and Bill Hernlund and Todd Crawford of Missouri Department of Natural Resources.

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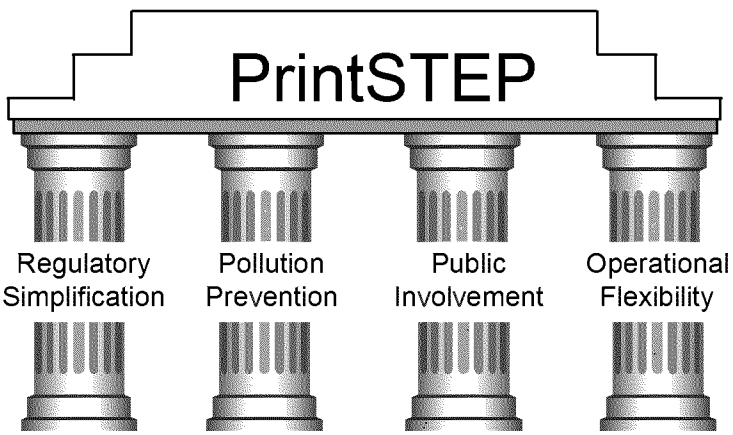
• PRINTSTEP PILOT PROGRAM EVALUATION •

Introduction

Printing, like any industry, has regulatory requirements that limit a facility's releases into the environment. Many in the printing industry, as well as representatives from state and federal government, environmental justice groups, and labor found these regulations could be complicated and confusing, especially for small businesses. The U.S. Environmental Protection Agency brought representatives from these organizations together to form a national team which developed the Printers' Simplified Total Environmental Partnership (PrintSTEP), a voluntary, multimedia alternative to the traditional administration of environmental regulation and permitting. PrintSTEP is intended to simplify these regulations and encourage awareness of environmental regulation in the printing industry. The National PrintSTEP team held numerous facilitated meetings with the goal of developing a commonsense approach to environmental protection in the printing industry. PrintSTEP was designed to meet the following **goals**:

- Enhance environmental protection.
- Increase use of pollution prevention practices.
- Improve efficiency of the regulatory process for printers.
- Improve efficiency of the regulatory process for state governments.
- Enhance public involvement.
- Provide motivation for stakeholders to participate in PrintSTEP.

The six goals of the PrintSTEP team were translated into the PrintSTEP pilot with features described as the four "**pillars**" of PrintSTEP:



- **Regulatory simplification.** PrintSTEP combines environmental regulatory programs impacting printing facilities into one modular, multimedia system. This system is intended to make it simpler for printers, regulators, and the public to understand printers'

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environmental requirements, and easier for printers to comply with the requirements. Further, plain language tools were created to assist printers in determining their air emissions and regulatory requirements.

- **Pollution prevention.** Pollution prevention refers to changing industrial processes to generate less pollution in the first place, instead of treating and disposing of it after it is created. According to the Environmental Protection Agency's (EPA's) pollution prevention hierarchy, pollution prevention is a more efficient way of protecting the environment than after-the-fact treatment and disposal. Technical assistance was available through PrintSTEP to help printers prevent pollution. PrintSTEP was also structured so that the level of regulatory oversight would be proportional to the level of waste or emissions, thereby encouraging pollution prevention.
- **Public involvement.** PrintSTEP was designed to provide an opportunity for regulatory agencies, the printer, and the community to educate each other on environmental concerns and interests. PrintSTEP required that early and actual notice be provided to the surrounding community and "registered interested parties," and included opportunities for public meetings to address community concerns related to printers' environmental impacts.
- **Operational flexibility.** PrintSTEP was designed to streamline the permit process to give printers the ability to make certain changes to their processes without having to change their permit. This streamlining was accomplished by establishing "levels" for air emissions and hazardous waste generation. Each PrintSTEP air level, for example, corresponds to an allowable range of emissions. If a facility wanted to make a change to its operations that affected air emissions, it could do so without going through a regulatory approval process provided the change did not cause facility wide emissions to exceed the range of the facility's air level. Multimedia permitting was also intended to encourage holistic consideration of facility emissions.

To test the PrintSTEP concepts developed by the national PrintSTEP team, EPA entered into cooperative agreements with the Missouri Department of Natural Resources (MO DNR) and the New Hampshire Department of Environmental Services (NH DES). The MO DNR agreed to conduct a PrintSTEP pilot in the St. Louis area. The NH DES decided to pilot the PrintSTEP program statewide. Initially, Minnesota was also a PrintSTEP participant but subsequently withdrew from the program (see Appendix A).

The EPA commissioned an evaluation of the PrintSTEP pilot program, the results of which are documented in this report. As such, it presents qualitative and quantitative information collected from printers at the beginning and end of the pilot. It also presents information from the other participants, the state grantees and community stakeholders. For comparison purposes, information on printers participating in PrintSTEP as well as those not participating is presented. The information and analysis are presented in a summary and in the form of recommendations at the conclusion of the report.

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Structure of the PrintSTEP Program

The overarching goal of PrintSTEP was to help the printing industry achieve cleaner, cheaper, and smarter environmental protection through the creation of a simpler regulatory "framework." PrintSTEP did not change the existing environmental regulations impacting the printing industry. Instead, it changed the process of implementing those requirements. PrintSTEP was intended to improve environmental performance, be more efficient, and make the regulatory process easier to understand for both the printer and the general public. Further, the specific PrintSTEP approach was designed to encourage all stakeholders involved with the printing industry to become involved and contribute positively. Each state grantee established a local Stakeholder Advisory Group with representatives from industry, government and community groups. The state PrintSTEP Coordinator worked with these groups to customize the program designed by the national PrintSTEP team to meet their specific state and/or local needs.

In PrintSTEP, a printer's environmental requirements depended on the quantity of emissions or wastes a printing facility generated. PrintSTEP facilities with lower environmental releases had fewer requirements. Those printing facilities with the lowest releases would qualify for a PrintSTEP "Notification," and those with greater releases received a PrintSTEP "Agreement."

- A **Notification** required that printers document their environmental releases and send a completed PrintSTEP Application to the state environmental agency. These printers had to operate within the requirements described in the PrintSTEP Workbook, explained below, and maintain their Notification status, but in most cases no further contact with the state agency was required.
- An **Agreement**, intended for printers with greater environmental impact, also required that the printer document its environmental releases by sending a completed PrintSTEP Application to the state environmental agency. The printer then worked with the state and the community to develop a PrintSTEP Agreement. Printers in this category were required to notify the public of its Application and invite comments.

In addition, each pilot state created a Registry so that anyone interested in PrintSTEP could be put on a list to be notified of any activities. Lastly, all Applications, both Notifications and Agreements, were filed in an **Information Repository,** which was housed at local libraries, other public buildings, or on the Internet.

The national PrintSTEP team developed the following documents to assist with the PrintSTEP pilot implementation. Each pilot area customized these documents to reflect the way it implemented the pilot.

- **Guide to States.** This document outlined the goals, features, and anticipated benefits of the PrintSTEP alternative regulatory system. The document also included an implementation strategy to assist states in defining eligibility requirements, regulatory

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thresholds, streamlining options, and geographic areas in which to implement pilot projects.

- **Printers' Plain Language Workbook.** This workbook outlined the entire PrintSTEP system and specifically identified what the printer had to do to meet environmental regulatory requirements. This multi-media workbook was provided to grantees as a template to be adapted to include state-specific needs. After state-specific modifications were made, the workbook was made available to printers and other interested parties in each state pilot location.
- **Community Handbook.** The community handbook was written for communities, containing plain-language information outlining the PrintSTEP public involvement provisions and explaining how the community, industry, and state regulators could work together to meet the goals of the PrintSTEP pilots.
- **Evaluation Strategy.** This document outlined how information would be collected and analyzed to determine whether PrintSTEP was beneficial for stakeholders and the environment.

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Evaluation Methodology

Because PrintSTEP is a multifaceted program, it has a variety of goals. Evaluating if these goals were met required a range of distinct data collection and analysis activities. This report documents the results of a comprehensive evaluation using information obtained from PrintSTEP participants as well as from non-participating printers. The information was collected using the techniques summarized in Table 1.

Table 1: Mechanisms Used to Collect Data to Evaluate PrintSTEP Program

Mechanism	State Agencies	Printers	Public	Information Collected
Telephone Surveys: *Baseline, midpoint and endpoint*		X		Participating printers' pre-PrintSTEP understanding of regulations, motivation to join PrintSTEP, and experiences with PrintSTEP. (qualitative)
Applications: *Baseline and endpoint*		X		Participating printers' air, hazardous waste, water, storm water, and pollution prevention data. (quantitative and qualitative)
State Databases: *Baseline and endpoint*		X		Nonparticipating printers' air and hazardous waste data. (quantitative)
Interviews: *Baseline and midpoint*	X			With state personnel — Agency function and organization pre- and post-PrintSTEP and implementation experiences. (qualitative)
Questionnaires: *Endpoint*			X	With stakeholder advisory group participants — Public interest in PrintSTEP. (qualitative)

Printers: Telephone Survey and PrintSTEP Application Forms

It is critical to the evaluation to understand how printers view the PrintSTEP program, how their environmental performance changed, and what they see as the drawbacks to program participation. Printers were interviewed by telephone three times over the course of the pilot: at the start (baseline) of the pilot, midway through the pilot, and again at the end of the pilot. The Baseline survey established a starting point against which subsequent measures were compared. The midpoint survey collected information on the printers' opinions about the initial application process and initial changes they made at their facility. This information is likely to be more accurate if collected at an interim point than it would be if it were collected at the end of the pilot, when recall wouldn't be as strong and greater staff turnover could occur. Instead, the endpoint survey focused primarily on overall satisfaction with the program and assessing the burden of the pilot on participants; areas where any impacts are not likely to be as evident earlier in the program. The national PrintSTEP team provided significant input into the survey instruments. A sample survey instrument, the end-point survey for printers, is provided in Appendix B.

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In addition to the telephone surveys, the PrintSTEP Application provided data on air emissions, hazardous waste generation, stormwater and wastewater status, as well as background information characterizing the facility by type of printing operations and number of employees. Participating printers completed the Application upon joining PrintSTEP, and provided updated information at the end of the pilot. A sample application form, used in New Hampshire, is provided in Appendix C.

Initially the pilot evaluation design called for a "control group" of printers that did not participate in the pilot. The purpose of a control group was to account for confounding factors (e.g., changes in the economy or in technologies) that might undermine the ability to attribute observed changes to the PrintSTEP pilot. However, as the PrintSTEP program was implemented, stakeholders determined that obtaining the participation of printers who were not engaged in PrintSTEP was not realistic. Based on input from printers and the national PrintSTEP team[0], it was clear that printers who did not volunteer to be a part of PrintSTEP were unlikely to voluntarily complete the surveys necessary for evaluation purposes. Therefore, to account for changes occurring during the pilot that may be sector-wide, rather than attributable to PrintSTEP, the evaluation took into account data on non-PrintSTEP printers from existing state databases; data on both air emissions and hazardous waste generation were available for the non-participants.

State Agency: In-person and Telephone Interviews

With regard to state environmental agencies, the critical outcome to be evaluated was efficiency: was the PrintSTEP approach more or less efficient than the traditional approach? In-person interviews were conducted with state government personnel at the baseline, and telephone interviews were conducted toward the end of the pilot. Questions about the organization of media programs and multi-media office coordination were explored, as well as staff's opinions on the costs and benefits of PrintSTEP. The PrintSTEP Coordinator for each pilot was also asked to collect information on the length of time it took to process permits under the traditional system compared to the time to implement the PrintSTEP pilot.

Community: Questionnaires

To evaluate the effectiveness of the public involvement component of PrintSTEP, a survey of participating community members was originally planned as part of the PrintSTEP evaluation. However, because no individual community members commented on any PrintSTEP Applications or placed their names in the PrintSTEP Registries, this survey could not be administered. Instead, the PrintSTEP Coordinators solicited comments from their Stakeholder Advisory Groups on the community involvement aspect of PrintSTEP. This approach was used to gather as much information as possible on why there was such limited interest from the public.

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EvaluationLimitations

In reviewing the findings presented in this report, it is important to keep the limitations of this study in mind:

- For each round of telephone surveys, multiple attempts were made to contact every participating printer, however, not all participants responded. The decreased response rate at the endpoint could influence the findings presented in this report. If there are significant differences between the respondent population and non-respondents, the survey results may not accurately reflect the opinions and activities of all participants.

Number of PrintSTEP Participants and Survey Responses		
	St. Louis,Missouri	New Hampshire
Initial Participants	11	47
Endpoint Participants	9	45
Endpoint Annual Reports Received	8	40
Respondents to Baseline Survey	11	47
Respondents to Midpoint Survey	8	43
Respondents to Endpoint Survey	7	31
Sources: Missouri and New Hampshire PrintSTEP Applications, Annual Reports, PrintSTEP pilot baseline, midpoint, and endpoint telephone survey of participating printers.		

- The findings of the evaluation are only as accurate as the information provided by respondents. In some cases, interviewees may have misinterpreted questions or inadvertently reported inaccurate information. In addition, some respondents may not have been fully aware of which aspects of the pilot were attributable to PrintSTEP and which were related to existing requirements that they had not known about. For example, New Hampshire's air toxics requirements were in effect well before PrintSTEP, however many printers were not aware of the requirements until they joined PrintSTEP. This led some printers to associate the burden of calculating their air toxics with PrintSTEP when, in fact, they were subject to this requirement regardless of PrintSTEP.
- Overall, given the number of participants in PrintSTEP versus the number of printers nationwide, it's unrealistic to apply the results presented in this study to the printing industry as a whole.
- The influence of confounding factors on the findings was minimized through the use of state-level data for non-PrintSTEP printers. Comparing PrintSTEP changes over time to the changes for these non-PrintSTEP printers was intended to account for industry-wide trends that are not unique to pilot participants, such as changes in economic conditions or printing technologies. While the data used accomplished this to some degree, the only data available were from state databases for air emissions and hazardous waste. The states maintain this type of data only for facilities meeting certain thresholds. Thus, smaller facilities are typically not included. Printers are typically small facilities, and so the comparison was likely not of equals. However, the non-PrintSTEP printer data were examined from the perspective of a percentage change over time to mitigate the impact of confounding factors.

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Implementation of the PrintSTEP Pilots

DescriptionofthePilotProgramsinEachState

Initially, a total of 61 printers participated in PrintSTEP in two states. In Missouri, where the program was implemented in the St. Louis region, 11 printers initially joined.[1] If a participating printer had any existing permits, such as would be required if their air emissions exceeded state or federal thresholds, these permits were referenced (but not replaced) in the PrintSTEP Agreements. In New Hampshire, where the program was implemented statewide, 50 printers participated, and PrintSTEP Agreements replaced any new permits that may have been required. Each state chose their approach based on the legal advice received within their state agency. In both states, participation was voluntary and both pilot areas included participating and nonparticipating printers.[2] At the end of the pilot, data from nine participants from Missouri and 40 from New Hampshire[3] were included in the evaluation.

The state environmental agencies for both pilots received an EPA cooperative agreement to administer the pilot project. Each state agency used a portion of their grant funding to hire a PrintSTEP Coordinator whose role was to administer the program, refine the PrintSTEP template developed nationally to meet state/local needs, recruit printers, and provide on-going technical assistance to participants.

The **Missouri** PrintSTEP pilot was formally launched in 2001, and Notifications and Agreements were finalized early in 2003. PrintSTEP was administered by the Missouri Department of Natural Resources (DNR), Division of Environmental Quality. In Missouri, the PrintSTEP pilot was implemented in the St. Louis area, overseen by the Air and Land Protection Division with day-to-day activities directed by the PrintSTEP Coordinator. The Coordinator worked closely with the Missouri Air Conservation Commission and the Metropolitan St. Louis Sewer District during the pilot development, as described below.

The **New Hampshire** PrintSTEP pilot was implemented statewide by the New Hampshire Department of Environmental Services (NHDES) Small Business Technical Assistance Program (SBTAP). The program was launched in 2001, with Applications received in 2002 and Notifications and Agreements finalized in 2003. SBTAP's Small Business Ombudsman oversaw the pilot, with day-to-day activities directed by the state PrintSTEP Coordinator. The Coordinator worked with NHDES air, water, and hazardous waste staff as needed to implement the pilot. The media offices were involved with up-front development of the

[1] Two of these printers dropped out early in the pilot; one closed owing to a fire and the other declared bankruptcy.
[2] New Hampshire has a total of approximately 300 printers statewide.
[3] One printer in Missouri failed to submit a report because the company went bankrupt. Five of the New Hampshire printers failed to submit their endpoint report, and two formally dropped out of the program.

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program, but were not involved in the Application process or in assisting printers throughout the pilot. The local trade association, Printing Industries of New England (PINE), was also substantively involved. PINE participated in the training workshops, as well as assisting printers with the application process. The Small Business Development Center (SBDC), a non-profit organization that provides free technical assistance to businesses in NH, also participated in the workshops and assisted printers in applying to the program.

NH DES intends to continue the PrintSTEP program within the state beyond the life of the pilot and the EPA cooperative agreement.

Streamlining and Interagency Cooperation

In **Missouri**, interagency cooperation resulted in two actions that helped streamline regulations for printers in St. Louis:

- **Permit variance from the Missouri Air Conservation Commission.** The PrintSTEP program was designed to provide flexibility for printers when they needed to add new equipment that would increase air emissions. In the pilot, emissions could be increased within the printer's PrintSTEP air level with a simple notification to Missouri DNR and no further requirements. Modification of the Agreement, with associated public participation requirements, was only necessary when the facility's air level was going to be exceeded. Because this approach was at odds with state air pollution rules, the Missouri Air Conservation Commission agreed to grant a variance from the air pollution construction and operating permit rules. This variance was reinstated each year of the program.
- **Memorandums of understanding (MOUs).** MOUs were agreed to and signed by the Missouri DNR with the following local regulatory agencies:
  - City of St. Louis, Division of Air Pollution Control.
  - St. Louis County Health Department.
  - Metropolitan St. Louis Sewer District.

Development of MOUs was necessary because the participating printers operate within the jurisdictional boundaries of these agencies. The MOUs allowed Missouri DNR to conduct PrintSTEP within the local regulatory agency's jurisdiction in a cooperative and coordinated manner. No changes were made to the local fee and reporting structures. The local agencies were also instrumental in the development of the state PrintSTEP reporting methods themselves.

Under a supplemental cooperative agreement with EPA, the MO DNR developed a multi-media annual reporting form. Because this form was not completed as part of the original PrintSTEP grant or in time for implementation under this pilot, it is not evaluated in this report, but is available from the MO DNR.

In **New Hampshire**, formal interagency cooperation was not needed in the same way as in Missouri. Every media included in the New Hampshire PrintSTEP program is regulated at

the state level, with the exception of storm water (federal) and waste water (local). The New Hampshire PrintSTEP program had the flexibility to combine all the rules into one program.

Outreach by the States

In **Missouri,** the PrintSTEP Coordinator visited each participating facility at least twice, the first time to introduce the printer to the program and a second time to help the printer complete the Application form. During these visits the Coordinator suggested changes to improve environmental performance and compliance, as described later in the report. Throughout the pilot, the Coordinator assisted the printers with process changes, annual reports, and other issues.

Missouri's outreach activities to inform printers and the public about PrintSTEP included the following:

- **Formation of a stakeholder advisory group**. A St. Louis PrintSTEP stakeholder advisory group (SAG) was established in December 1999. The group worked with Missouri DNR to determine how to implement the local PrintSTEP program. Representatives from the Missouri DNR, the Rainbow Chamber of Commerce, the Wesley House Association, the American Lung Association of Eastern Missouri, Commercial Lithographic Company, Conservation Federation of Missouri, Fleming Promotional Graphics, Printing Industries of St. Louis, and the U.S. Environmental Protection Agency Region 7 office took part. The SAG met 20 times during the project and was substantively involved throughout the program.
- **Incorporatation of input from the SAG**. The SAG customized the PrintSTEP program design and worked together to complete the background and outreach materials for the pilot.
- **Development of a community handbook and brochure**. The SAG published the St. Louis PrintSTEP Community Handbook and brochure in December 2001. The handbook was intended to help community members participate by explaining the PrintSTEP process and the environmental requirements faced by printers.
- **Development of press releases**. Missouri PrintSTEP issued two press releases in December 2001.
- **Publication of newspaper articles**. Two local newspaper articles were published to inform the general public about the PrintSTEP program.
- **Publication of articles in newsletters**. Three industry organization newsletters published articles about the Missouri PrintSTEP program to inform printers about the pilot.
- **Placement of a radio announcement**. Missouri PrintSTEP placed one radio announcement.
- **Establishment of public information repositories**. Public information repositories were established and maintained detailed reference information about PrintSTEP and its participating printers. The repositories were located at six St. Louis county libraries and two local Missouri DNR offices near the PrintSTEP printers to improve public accessibility.

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- **Establishment of a PrintSTEP website**. Missouri DNR developed a PrintSTEP website (http://www.dnr.mo.gov/printstep/index.html) that maintained detailed information about PrintSTEP and participating Missouri printers.
- **Contact with local officials**. Letters were sent to local elected officials to inform them of the printers participating in their area and to highlight the public involvement component of the program.
- **Hosting of introductory breakfast workshop**. A workshop was held to introduce the PrintSTEP program to local printers. The workshop was led by the PrintSTEP Coordinator together with printing trade association representatives.
- **Training of State and Federal Regulatory Personnel** To assist the state and federal regulatory personnel in understanding both the industry and applicability of the PrintSTEP program, national trade association representatives conducted informational training on the printing industry. This helped to set a baseline of knowledge for all regulatory personnel involved in the development of the program.

Some participating printers conducted additional public outreach, as described in the *Impact on Public Involvement* section of this report.

In **New Hampshire**, the PrintSTEP Coordinator and other state agency staff involved in implementing PrintSTEP conducted extensive outreach. NH DES strongly encouraged printers to join and offered to work with printers to ensure that they were in compliance. Every eligible printer in the state was called encouraging them to attend informational workshops. New Hampshire had several people working on recruiting printers and offering help with applications, including on-site assistance. Overall, an estimated 35 out of 47 printers applying to the program received technical assistance on their Application. This assistance fostered a relationship between the printers and the state agency so that printers were comfortable contacting the agency to ask questions throughout the length of the pilot. For example, following the announcement of new, statewide regulatory changes regarding hazardous waste requirements, the PrintSTEP Coordinator sent each participating printer a letter. She received many follow-up phone calls and was able to assist those printers directly.

NH's outreach activities to inform printers and the public about PrintSTEP included the following:

- **Formation of a stakeholder advisory group**. The New Hampshire PrintSTEP stakeholder advisory group, called the PrintSTEP Stakeholder Group (PSG), was established in 2000. Representatives of New Hampshire DES, the EPA, environmental justice groups, printing organizations, trade associations, the Audubon Society, and legislative affiliations were invited to participate as stakeholders. The PSG was invited to provide input and guidance to the New Hampshire DES on how to implement the PrintSTEP program. More than 10 stakeholders meetings were held over the duration of the program. However, the PrintSTEP Coordinator and other government stakeholders judged that while the PSG was initially strong, after the first few meetings, members

representing community interests no longer participated. The Coordinator interpreted this lack of participation as possibly a result of sporadic communication from the pilot staff to PSG members, as well as limited interest.

- **Hosting workshops for printers**. Twelve workshops were held for printers at different times and locations throughout the state to introduce them to PrintSTEP and to assist with the application process. Several New Hampshire DES staff and PSG members were extensively involved in these workshops, including staff from the SBDC, PINE, and the SBTAP.
- **Development of a community handbook**. A community handbook was developed in January 2001 and made available to those interested. The handbook was intended to help communities participate in the pilot by explaining the PrintSTEP process and the environmental requirements faced by printers.
- **Publication of a press release**. The general public was introduced to the PrintSTEP program in a press release distributed to various newspapers around the state at the initiation of the program.
- **Publication of articles in a newsletter**. The PrintSTEP staff wrote articles for a quarterly newsletter published by the state's small business assistance program and distributed to small businesses in New Hampshire.
- **Publication of a PrintSTEP brochure**. A PrintSTEP brochure was developed and distributed to all identified printers in New Hampshire and to other interested entities.
- **Establishment of public information repositories**. A public information repository was established at the New Hampshire DES offices in Concord, New Hampshire. The repository maintained information about PrintSTEP and its participating printers. For printers with Agreement status, information repositories were also established in the town offices of the towns where the participating printers were located.
- **Establishment of a PrintSTEP website**. To improve information access beyond the information repositories, the New Hampshire DES developed a PrintSTEP website (http://des.nh.gov/SBTAP/printstep/). The website maintained references and information about PrintSTEP and its participating printers, including each printer's application information.
- **Publication of legal notices in local newspapers**. To inform members of the public that a printer in their area submitted a PrintSTEP Application for an Agreement, New Hampshire DES published legal notices in local newspapers. A second legal notice was also published when the Agreement was drafted.
- **Contact with local officials**. Legal notices were sent to local elected officials to inform them of the printers with Agreement status participating in their area.

Some participating printers conducted additional public outreach, as described in the *Impact on Public Involvement* section of this report.

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PrintSTEPParticipants

In St. Louis, **Missouri**, a total of 11 printers joined the PrintSTEP pilot: four printers signed PrintSTEP Agreements with Missouri DNR, and seven printers with lower release amounts qualified for PrintSTEP Notifications. Of the printers with Agreements, two qualified for an Agreement based on air emissions of volatile organic compounds (VOCs) and two qualified based on their hazardous waste generation. By the end of the pilot, one PrintSTEP printer had merged with another PrintSTEP printer after a fire closed its business; one went bankrupt. The MO pilot ended with nine participating printers, but endpoint information for the evaluation was received from eight printers as another participant went out of business.

In **New Hampshire**, 50 printers joined the PrintSTEP pilot; however, three of these printers joined after the initial application period and therefore, were not included in the evaluation. The majority of the participants are small businesses with lesser emissions and discharges; as a result, they maintained Notification status. Three New Hampshire printers signed PrintSTEP Agreements, primarily due to having air emissions above threshold levels. Two printers, both with Notifications, asked to be taken out of the program and another five did not submit endpoint information. As a result, data on 40 NH printers are included in the evaluation.

Table 2: PrintSTEP Printers

State	Baseline Data Received			Endpoint Data Received		
	Total	Notifications	Agreements	Total	Notifications	Agreements
Missouri	11	7	4	9	6	3
New Hampshire	47	44	3	40	37	3

Participating printers were required to complete a PrintSTEP Application when they joined the program. The Application requested information describing their facility's characteristics, environmental releases, and pollution prevention activities. Each printer was again asked to update the information on their original Application at the end of the pilot. Information for the years 2001 or 2002, and 2004 was collected. Variation in the baseline date occurred depending on exactly when a printer joined the program.

As shown in Table 3, endpoint information was received from eight printers in Missouri and 40 printers in New Hampshire. The table also indicates the total number of employees at the participating facilities and the range of employees at the printing facilities.

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Table 3: PrintSTEP Printers						
State	Number of Facilities Participating*		Number of Employees at Baseline		Number of Employees at Endpoint	
	Baseline	Endpoint	Total	Range	Total**	Range
Missouri	11	8	1,023	12–320	706	14–200
New Hampshire	47	40	1,157	1–190	1,105	1–190
TOTAL	**56**	**48**	**1,987**		**1,811**	
* This number reflects the number of printers that submitted data and are therefore included in this evaluation. ** One printer from New Hampshire did not provide employee data in the endpoint.						
Source: Missouri and New Hampshire PrintSTEP Applications and Annual Reports.						

Table 4 presents PrintSTEP printers by their print process. Note that facilities may have more than one printing process.

Table 4: Type of Printing Operations						
Printing Process	Number of Facilities					
	St. Louis, Missouri			New Hampshire		
	Baseline	Endpoint	Percentage Change (%)	Baseline	Endpoint	Percentage Change (%)
Sheetfed Lithography	6	4		27	29	7
Nonheatset Web Lithography	1	2	100	3	4	33
Heatset Web Lithography	1	0		3	3	
Flexography	1	1		3	3	
Screen Printing	1	1		6	6	
Gravure	0	0		0	0	
Digital	3	4	100	5	7	40
Prepress	8	6		n/a	n/a	n/a
Source: Missouri and New Hampshire PrintSTEP Applications.						

As shown in Table 4 and described elsewhere in this report, some PrintSTEP printers exhibited growth during the pilot period by adding presses and expanding operations. It's also notable that PrintSTEP printers mirrored the sector-wide trend seen over these years of adding digital capability while maintaining operations of their other processes.

Table 5 illustrates how the PrintSTEP printers compared with the general population of printers. As seen in the table, the distribution of printing types for PrintSTEP printers based on their primary printing process at the pilot endpoint is fairly representative of state and national distributions, with a slightly greater proportion of flexographic printers in the PrintSTEP population. This difference may reflect double counting in those cases where a printer had multiple printing processes on site.

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Table 5: Type of Printing Operations (at endpoint)								
Printing Process	Percentage of Facilities				Average Number of Employees per Printer			
	For PrintSTEP Printers		By State		For PrintSTEP Printers		By State	
	MO	NH	MO	NH	MO	NH	MO	NH
Lithography	66%	90%	78%	77%	54	28	18	17
Flexography	13%	8%	5%	2%	140	118	30	95
Screen Printing	13%	15%	15%	21%	97	10	14	16
Source: Missouri and New Hampshire PrintSTEP Applications; U.S. Census Bureau, County Business Patterns, 2003; available at: http://www.census.gov/epcd/cbp/view/cbpview.html								

MotivationsforJoiningPrintSTEP

The developers of PrintSTEP felt it was important to understand the participating printers' motivations for joining the pilot. This information helps to determine whether PrintSTEP meets the expectations of its participants and also provides valuable input in the development of future voluntary programs. The information presented in this section is based on the participants' responses to the baseline telephone survey.

Printers expressed a variety of motivations for joining PrintSTEP; the most frequent response was that they joined to improve their environmental compliance and better understand their environmental requirements. Of the 58 printers responding, 67% (39 of 58 printers) stated compliance and better understanding of the requirements as their motivation for joining. Specifically, printers said:

- "We're a small business, so I thought it would be a good way to learn the regulations."
- "Primarily, I wanted to make sure we were in compliance."
- "I knew there were regulations, and I wanted to make sure we were in compliance."

The next most frequent response was saving time and effort; however, this reason was a distant second with 14% (8 of 58) of printers giving this response. Specifically, printers commented:

- "I like the simplified reporting with one-stop shopping for information."
- "[I want to] minimize time and effort for reporting."

Table 6 summarizes all responses.

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Table 6: Reasons Why Printers Chose to Participate in PrintSTEP	
Reason	Percentage Responding
Improve compliance/better understand environmental requirements/improve environmental performance	67% (39/58)
Minimize time and effort for environmental requirements/simplified reporting/single cross-media contact	14% (8/58)
Worried about being targeted for inspections if their facility did not join	9% (5/58)
Community responsibility of public image	5% (3/58)
Encouraged by state or trade association	5% (3/58)

Impacts of PrintSTEP

ImpactonEnvironmentalProtectionandPractices

This section presents information on changes in environmental practices and results from PrintSTEP. Specifically, changes in environmental outcomes, pollution prevention, and regulatory compliance are presented. In addition to overall environmental improvement, the main pillar of PrintSTEP addressed by this information is:

- **Pollution Prevention.** PrintSTEP was designed to encourage pollution prevention by providing technical assistance and showing that the level of regulatory oversight is proportional to the level of waste or emissions.

Quantitative information was obtained to assess changes in environmental releases, discharges, and practices for PrintSTEP printers as well as for non-PrintSTEP printers. The years examined were 2001 and 2004.

For PrintSTEP printers, the information used in this evaluation was reported on the PrintSTEP Application, and then again in a final report in the same format as the original Application. The following information was obtained from PrintSTEP printers to evaluate environmental outcomes:

- Waste water management method.
- Storm water exposure status.
- Hazardous waste generation and Resource Conservation and Recovery Act (RCRA) generator status.
- PrintSTEP air level.
- VOC and regulated toxic air pollutant (RTAP) emissions.[4]
- Public participation activities.
- Pollution prevention activities.
- A production activity indicator (PAI) chosen by the facility to normalize data to account for changes in production.

To account for changes occurring during the pilot that may be sectorwide rather than attributable to PrintSTEP, data were examined using available information on non-PrintSTEP printers from existing state databases. The following data were obtained on non-PrintSTEP printers:

- Quantity of hazardous waste manifested.[5]
- VOC or RTAP emissions.

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[4] In Missouri, VOC emissions were reported. In New Hampshire, RTAP emissions were reported. RTAPs include VOCs, hazardous air pollutants (HAPs), and other toxic air pollutants.

[5] Note that PrintSTEP printers reported waste generated, while state databases capture waste that is manifested. This difference does not affect the analysis, as only relative change is examined and quantitative differences between the two populations are not directly compared.

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For these two parameters, data were available for only those printers that were RCRA large quantity generators (LQGs) or that had an air permit. Nonetheless, this information provides additional insight into changes observed in participants' environmental characteristics and helps to determine whether changes were a result of the pilot or of factors influencing the industry as a whole. Waste water is managed at the local level, so data on this release and others were not available. In place of the PAI used for PrintSTEP printers, state-specific normalizing factors were used to account for changes in industry activity level in the non-PrintSTEP population.[6]

Air Emissions

In most types of printing processes, air emissions are printers' primary environmental concern. Typically, printing operations may release VOCs, a contributor to ground-level ozone, and hazardous air pollutants (HAPs), also known as air toxics.

VOCs used at printing facilities are typically found in inks, coatings, adhesives, cleaning solutions, and fountain solution/fountain solution additives. Depending on the amount of these chemicals used, a printing facility participating in PrintSTEP was placed into different "levels" for air emissions, which were used to determine the facility's environmental requirements. PrintSTEP 's five air levels ranged from Level 1, representing the lowest air emissions, to Level 5, representing the highest. Tables 7 and 8 present each air level and its corresponding volume of VOC material for Missouri and New Hampshire, respectively. Facilities also estimated their HAPs as another factor in determining their air level.

The national PrintSTEP team provided a tool to simplify these VOC and HAP calculations for printers by developing "material use worksheets." These worksheets allowed the printers to calculate their quantities of VOC-containing materials used in one year. Air levels are based on this quantity of material actually used, rather than on having to calculate emissions. Given that quantities of materials used are usually readily available through purchasing or inventory records, these worksheets set out to simplify the VOC and HAP estimation process for printers. The following tables also illustrate how two different states implemented the PrintSTEP program to coordinate with specific state requirements.

[6] The normalizing factor is based on the U.S. Census Bureau 2000–2003 change in number of employees for each state's commercial lithographic, gravure, flexographic, and screen printing industry. Printing support services are not included.

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Table 7: Material Use Air Level Table for VOCs — Missouri			
Air Level	Sheetfed Offset or Nonheatset Web Lithography, or Screen Printing	Heatset Web Offset Lithography, or Flexography or Rotogravure with Solvent-Based Inks	Flexography with Water-Based Inks
Level 1	Less than 2,855 gals	Less than 20,000 lbs	Less than 80,000 lbs
Level 2	2,855–7,135 gals	20,000–50,000 lbs	80,000–200,000 lbs
Level 3	7,135–14,275 gals	50,000–100,000 lbs	200,000–400,000 lbs
Level 4	14,275–28,550 gals	100,000–200,000 lbs	400,000–800,000 lbs
Level 5	more than 28,550 gals	more than 200,000 lbs	more than 800,000 lbs
Source: Missouri Plain Language Workbook.			

Table 8: Material Use Air Level Table for VOCs — New Hampshire			
Air Level	Sheetfed Offset or Nonheatset Web Lithography, or Screen Printing	Heatset Web Offset Lithography, or Flexography or Rotogravure with Solvent-Based Inks	Flexography with Water-Based Inks
Level 1	Less than 1,425 gals	Less than 10,000 lbs	Less than 40,000 lbs
Level 2	1,425–3,560 gals	10,000–25,000 lbs	40,000–100,000 lbs
Level 3	3,560–7,125 gals	25,000–50,000 lbs	100,000–200,000 lbs
Level 4	7,125–14,250 gals	50,000–100,000 lbs	200,000–400,000 lbs
Level 5	more than 14,250 gals	more than 100,000 lbs	more than 400,000 lbs
Source: New Hampshire Plain Language Workbook.			

In Missouri, some facilities determined their PrintSTEP air level range using the material use worksheets, while other printers used the state's Emissions Inventory Questionnaire (EIQ). The EIQ requires facilities exceeding the reporting threshold of 876 pounds of VOCs, or 20 – 200 pounds of HAPs (depending on the "category" of the HAP) to submit data on their actual VOC or HAP emissions. This measurement method differs significantly from the material use worksheets, but several facilities had already calculated their VOC emissions to meet their EIQ requirements, so the EIQ was the easiest method for them.

In New Hampshire, each facility determined its VOC and HAP air level based on material use, as well as its air level based on emissions of RTAPs. An evaluation of RTAP emissions is required by the state's Air Toxics Rule. A permit is required for facilities that exceed a VOC, HAP or RTAP threshold. None of the PrintSTEP printers exceeded the HAP or RTAP threshold. Three printers exceeded the VOC threshold and therefore required an air permit which was incorporated into the printer's PrintSTEP Agreement.

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Table 9 presents the number of PrintSTEP printers at each air level at the beginning and end of the PrintSTEP pilot. The purpose of collecting and presenting air level information is to determine if printers changed their air emissions through participation in PrintSTEP. As can be seen in the table, most printers have low emissions. They fall within PrintSTEP Level 1 and remained there over the course of the pilot. One printer in Missouri moved up to Level 2 because they changed their product mix from black and white on newsprint to multicolor advertising pieces requiring more ink to be consumed.

Table 9: PrintSTEP Printers Air Level

Air Level	Missouri (VOCs) Number of Printers		New Hampshire (VOCs) Number of Printers	
	Baseline	Endpoint	Baseline	Endpoint
Level 1	9	5	37	30
Level 2	2	3	0	0
Level 3	0	0	0	0
Level 4	0	0	3	3
Level 5	0	0	0	0

Source: Missouri and New Hampshire PrintSTEP Applications.

Table 10 shows the number of PrintSTEP printers for which air emissions increased or decreased between the baseline and endpoint of the pilot. Air emission data differed in the two pilot programs owing to differences in state-specific air requirements. On the New Hampshire PrintSTEP Application, printers recorded their VOC emissions by level (VOC Level 1, 2, 3, 4 or 5) and their RTAP emissions by level (RTAP Level 1, 2) as well as actual RTAP emissions. For the Missouri Application, printers recorded their actual VOC emissions and VOC level. This distinction does not affect the results presented in this report because printers were compared only with other printers within their state. As shown in the table, six printers in Missouri increased air emissions over the life of the pilot, while one decreased. In New Hampshire, a majority, or 58% of printers (22 of 38) decreased emissions. Across both states, 51% of PrintSTEP printers (23 out of 45) demonstrated a reduction in air emissions during the pilot. The average percentage change shown in the last column of the table is based on average quantities released for each printer. The average percentage change shows an increase although decreases did occur for more than half of the printers. This apparent discrepancy is because the magnitude of emission increases exceeded decreases when the whole group is examined.

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Table 10: PrintSTEP Printers Change in VOC/RTAP Emissions					
State	Number of Facilities*	Decreased	Increased	Unchanged	Average Percentage Change
Missouri	7	14% (1/7)	86% (6/7)	0	+27%
New Hampshire	38	58% (22/38)	37% (14/38)	5% (2/38)	+42%
TOTAL	**45**	**51% (23/45)**	**44% (20/45)**	**4% (2/45)**	
Note: Change in emissions was normalized based on production activity indicators provided by the facilities. *The number of facilities that submitted endpoint data on air emissions and had air emissions.					
Source: Missouri and New Hampshire PrintSTEP Applications.					

For comparison purposes, Table 11 illustrates non-PrintSTEP printers' VOC emissions. These data reflect printers with air permits, as such printers are the only facilities required to report VOCs to the state agency. Data were obtained for 13 printers in Missouri and three printers in New Hampshire. Results show a majority of printers (10 out of 13 printers, or 77%) increased VOC emissions in Missouri, while in New Hampshire all three printers reduced VOC emissions. Overall, 63% of non-PrintSTEP printers (10 out of 16) showed an increase in VOC air emissions during the pilot.

Table 11: Non-PrintSTEP Printers Change in VOC Emissions			
State	Decreased	Increased	Unchanged
Missouri	23% (3/13)	77% (10/13)	0
New Hampshire	100% (3/3)	0% (0/3)	0
TOTAL	**38% (6/16)**	**63% (10/16)**	**0**
Note: Gross amount of emissions was normalized based on the change in the number of employees from 2000 to 2003 for each state's commercial lithographic, gravure, flexographic, and screen printing industry.			
Sources: Missouri's Department of Natural Resources and New Hampshire's Department of Environmental Services, 2001 and 2004 data; and (U.S. Census Bureau, County Business Patterns, 2003; available at: http://www.census.gov/epcd/cbp/view/cbpview.html			

From these limited data it can be observed that the pilot group had better performance than the non-PrintSTEP group, with 51% of facilities decreasing air emissions as compared with 38% in the non-PrintSTEP group. Note, however, that sample size for non-PrintSTEP printers is small compared with the universe of printers in each state.

Looking at the states individually, in New Hampshire, a majority of both PrintSTEP and non-PrintSTEP printers showed decreases in emissions during the pilot (58% and 100%, respectively). In Missouri, a minority of both PrintSTEP and non-PrintSTEP printers showed decreases in emissions (14% and 23%, respectively). It is notable that Missouri has a very small sample of printers from which to collect data. In both states, measurement in the PrintSTEP group was likely to be more accurate than for the non-PrintSTEP group owing to direct technical assistance from the PrintSTEP Coordinators. It may also be generalized that these printers tended to be more robust economically, as they are a self-selected group

interested in participating in an innovative environmental program. In Missouri, increases in VOCs can be attributed to changes at specific printing facilities:

- One printer changed to a higher VOC coating for performance reasons (i.e., so that signs now last longer).
- Another printer changed its market, eliminating gluing and expanded printing. This change increased its use of isopropyl alcohol and its emissions of VOCs.
- Two printers added presses. One of these printers also eliminated the use of all VOC-free products because they were expensive and the printer found the products didn't perform well for its printing applications.
- Another printer added four new production and printing units over the three-year period.

Hazardous Waste

Typical printer wastes that may be considered hazardous include some waste inks, waste solvent, spent fixer, processed developer, and solid wastes such as soiled absorbent materials. All hazardous waste must be managed following RCRA requirements to prevent its release into the environment.

Table 12 presents the number of PrintSTEP printers for which hazardous waste generation increased or decreased between the baseline and endpoint of PrintSTEP. As shown in the table, only one of the four Missouri printers generating hazardous waste decreased waste generation during the pilot. In New Hampshire, a majority, or 71% PrintSTEP printers (20) generating hazardous waste decreased their generation. Across both states, 66% of PrintSTEP printers (21 out of 32) decreased waste during the pilot. In some cases, the increases in waste reported can be attributed to improved compliance rates, where facilities that once were improperly disposing of hazardous waste began disposing of it properly and tracking it correctly as a hazardous waste. For specific printers in Missouri, increases in hazardous waste were seen during the pilot, mostly reflecting improved waste management and measurement practices but also owing to the addition of equipment not entirely offset by the printers' Production Activity Index.[7] For example, in one company three events occurred. They began removing more solvent from their wipes before sending them to be laundered and disposed of the additional waste solvent themselves. The same printer conducted a cleanout of outdated product after shifting its product mix, causing a large amount of hazardous waste to be disposed. And lastly, their measurement method changed, resulting in more accurate measures of waste volumes.

The average percentage change shown in the last column of the table is based on average volumes released for each printer. For Missouri, the overall volume increases were greater than the decreases when the group is examined as a whole.

[7] Each printer reported a Production Activity Index (PAI). The PAI indicates the relative change in the facility's level of production between the baseline and endpoint data collection under PrintSTEP. This evaluation used the PAI to determine if a change in emissions/waste was the result of a change in environmental management practices, or if the change was due to increasing or decreasing production.

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Table 12: PrintSTEP Printers Change in Hazardous Waste (number of printers)					
State	Hazardous Waste Generation				
	Number of Facilities*	Decreased	Increased	Unchanged	Average Percentage Change
Missouri	4	1 (25%)	3 (75%)	0	+112%
New Hampshire	28	20 (71%)	2 (7%)	6 (21%)	-14%
TOTAL	**32**	**21 (66%)**	**5 (16%)**	**6 (19%)**	
Note: Gross amount of waste generation was normalized based on production activity indicators provided by the facilities.					
*This number reflects the number of printers who submitted endpoint data on hazardous waste and generated hazardous waste. One New Hampshire printer generated hazardous waste at the end of the PrintSTEP pilot but not at the beginning, so no comparisons could be made.					
Source: Missouri and New Hampshire PrintSTEP Applications.					

For comparison purposes, Table 13 illustrates the number of non-PrintSTEP printers showing reduced quantities of hazardous waste manifested. (Non-PrintSTEP printers' data report the amount shipped, or manifested, as opposed to PrintSTEP printers, which reported waste generated. This distinction does not impact the like-to-like comparisons reflected in these tables.) Data were obtained from state databases for 25 and 70 non-PrintSTEP printers in Missouri and New Hampshire, respectively, and showed that 17, or 68%, of printers in Missouri decreased waste while 41% decreased waste in New Hampshire. Overall, 48% of non-PrintSTEP printers in Missouri and New Hampshire decreased waste during the pilot.

Table 13: Number of Non-PrintSTEP Printers — Hazardous Waste Generation				
State	Number of Facilities	Decreased	Increased	Unchanged
Missouri	25	17 (68%)	8 (32%)	0
New Hampshire	70	29 (41%)	41 (59%)	0
TOTAL	**95**	**46 (48%)**	**49 (52%)**	**0**
Note: Gross amount of waste generated was normalized based on the change in the number of employees from 2000 to 2003 for each state's commercial lithographic, gravure, flexographic, and screen printing industry.				
Source: Missouri's Department of Natural Resources and New Hampshire's Department of Environmental Services, 2001 and 2004 data; and U.S. Census Bureau, County Business Patterns, 2003; available at: http://www.census.gov/epcd/cbp/view/cbpview.html				

From these limited data it can be observed that the pilot group showed better performance than the non-PrintSTEP group, with 66% of facilities decreasing hazardous waste generation or manifesting, as compared with 48% in the non-PrintSTEP group.

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Looking at the states individually, in New Hampshire a majority of PrintSTEP printers showed decreases in hazardous waste during the pilot. This decrease is notable because during a similar time period, a minority of non-PrintSTEP printers did so. In Missouri, three out of four PrintSTEP printers showed increases while a majority of non-PrintSTEP printers showed decreases (noting that only four printers in the Missouri PrintSTEP group reported any hazardous waste at all). In both states, hazardous waste measurement in the PrintSTEP group was likely to be more accurate than for the non-PrintSTEP group owing to direct technical assistance during the pilot. There were other benefits separate from direct waste reduction. For example, two printers in Missouri changed from an LQG to a small quantity generator (SQG) during the course of the PrintSTEP pilot. This change had the benefit of reducing their regulatory burden, specifically training, reporting, and inspection requirements.

Waste Water

Most printers discharge their process waste water to their local sewer system, which in turn is managed by their local publicly owned treatment works (POTW). The POTW sets minimum requirements for dischargers and treats waste water before discharging it to surface waters.

PrintSTEP printers reported information on waste water discharge status, as shown in Table 14. All participating printers either discharge waste water to a POTW or do not discharge waste water at all. The purpose of collecting and presenting waste water information is to determine if any shifts in waste water management occur through participation in PrintSTEP. The reported data show that the waste water discharge status of PrintSTEP printers did not change in Missouri. In New Hampshire, no net change occurred. One printer previously discharged to a POTW and discontinued discharging effluent. However, another New Hampshire printer that previously did not discharge to a POTW reported the opposite change and now does. In this case, the printer is delivering rinse water from its plate developer to the POTW. Before PrintSTEP, this waste water was going to a holding tank and then was sent out as a hazardous waste. Since joining PrintSTEP the printer has been able to work with the POTW to have its waste water delivered on occasion to the POTW for treatment. Printers discharging to a POTW are not typically required to monitor specific pollutant concentrations; consequently, it was considered too burdensome to require this quantitative information for the purposes of this evaluation.

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Table 14: Waste Water Discharge Status						
	Number of Facilities*					
	Missouri			New Hampshire		
	Baseline	End-point	Percentage Change	Baseline	End-point	Percentage Change
Discharge waste water to a septic system	0	0	☐	0	0	☐
Discharge industrial waste water to the sewer district (POTW)	9	9	☐	22	22	☐
Designated as a significant industrial user (SIU)**	0	0	☐	0	0	☐
Discharge waste water directly to surface water (NPDES permit)	0	0	☐	0	0	☐
No discharge	0	0	☐	17	17	☐
* This number reflects the number of printers who submitted endpoint data for waste water. ** Any facility that discharges an average greater than or equal to 25,000 gallons per day of process waste water to the sewer system or meets other discharge criteria is considered an SIU.						
Source: Missouri and New Hampshire PrintSTEP Applications.						

Comparison data were not available for nonparticipating printers. Because waste water is controlled at the local level, it was not practical for the pilot states to obtain these data for printers in each municipality.

Storm Water

The Clean Water Act (CWA) also regulates storm water runoff that has been in contact with industrial storage materials, wastes, loading docks, and other potential sources of chemical contamination. These regulations prevent chemicals and wastes from contaminating surface and groundwater. All industrial facilities that potentially discharge storm water containing pollutants to a surface water of the United States must apply for coverage under a NPDES permit. However, a permit is not required at certain facilities that can certify that a “no exposure” condition is maintained. “No exposure” is when all potential sources of contamination are kept under cover, protected from precipitation.

PrintSTEP printers were asked to identify items exposed to precipitation, now or in the foreseeable future, and whether drainage from these areas discharged to any surface waters or to a storm sewer system. The purpose of collecting and presenting storm water information is to determine whether printers changed their storm water management practices through participation in PrintSTEP. This information was reported on a checklist and is summarized in the following paragraphs. Most PrintSTEP printers documented “no exposure” to storm water. Overall, there was no change in Missouri and no net change in New Hampshire for PrintSTEP printers requiring a storm water permit.

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Comparison data were not available for printers not participating in PrintSTEP.

Six printers in Missouri and 37 printers in New Hampshire had "no exposure" status at both the beginning and end of the pilot. In Missouri, the remaining printers[8] had storm water permits for the following reasons:

- Materials or products at uncovered loading docks (at endpoint only).
- Materials or products stored outdoors (except for products intended for outdoor use such as cars).
- Materials or products handled/stored on roads or railways owned or maintained by the certifier.
- Waste material.

In New Hampshire, the remaining two printers had storm water permits for the following reasons:

- Materials associated with vehicular maintenance, cleaning, or refueling (endpoint only).
- Spills/leaks resulting from maintenance of stacks of air exhaust systems.

One New Hampshire printer did not report their storm water status at the endpoint.

Use of Pollution Prevention Practices

Pollution prevention means changing operations to generate less pollution in the first place, instead of treating and disposing of it after it is created. Through PrintSTEP, printers had access to free technical assistance to find ways to prevent pollution. PrintSTEP also encouraged pollution prevention by highlighting how a printer's regulatory requirements decrease as the facility's overall potential environmental impact decreases. The fewer pollutant releases a printer has, the fewer the regulatory requirements. As part of their PrintSTEP Applications, printers were asked to review a list of pollution prevention activities and mark which ones they employed. Printers then completed this exercise again at the end of the pilot program. Table 15 summarizes the results of the changes in the pollution prevention activities undertaken by PrintSTEP printers over the course of the pilot program.

Table 15: Pollution Prevention Activities

Pollution Prevention Activities	Number of Facilities Implementing Pollution Prevention Activities					
	Missouri			New Hampshire		
	Baseline	End-point	Increase/ Decrease/ No Change	Baseline	End-point	Increase/ Decrease/ No Change
Eliminated chrome-based cleaners	1	1	□	12	16	▲
Installed and properly maintained silver-recovery units	4	5	▲	18	20	▲

[8] One printer documented more than one exposure type.

Properly maintained film and plate processing units (e.g., flow rates, squeegees, secondary containment, holding tanks, and pipes/tubing)	5	6	▲	n/a	n/a	n/a
Utilized "Code of Silver Practices" steps to recover silver from fixers	2	3	▲	n/a	n/a	n/a
Investigated/used developer and fixer recycling units for film processors*	4	5	▲	13	13	□
Investigated/used low replenishing rate film chemistry*	5	6	▲	22	23	▲
Investigated/used wash water recycling units for film and plate processors*	3	4	▲	12	12	□
Investigated/used digital, dry, or water-based proofing systems*	5	5	□	23	23	□
Instituted an ink inventory system to reduce waste ink disposal costs	6	6	□	n/a	n/a	n/a
Instituted a switch to low-VOC ink systems, such as UV-curable, water-based technology, or vegetable-based ink systems	7	7	□	20	19	▼
*Investigated/used stay open and cartridge ink delivery system for sheetfed offset lithographic inks	1	2	▲	19	19	□
Used chiller recirculators to lower temperature of fountain solutions to reduce evaporation and thus lower air emissions	3	3	□	14	12	▼
Instituted a switch to isopropyl alcohol–free fountain solutions or reduced concentration of isopropyl alcohol in fountain solution	3	3	□	25	25	□
Investigated the installation of filtration system for fountain solution recirculation system	4	4	□	10	9	▼

Switched to low-vapor--pressure or low-VOC cleaning solvents (less than 10 mm Hg at 20 degrees Celsius) to reduce air emissions and quantity of solvent purchased	5	5	□	21	20	▼
Eliminated the use of F-listed solvents and substituted D-listed or nonhazardous solvents to reduce the toxicity of hazardous waste generated	3	5	▲	25	22	▼
Instituted a solvent recycling/reuse system	1	0	▼	7	6	▼
Implemented a shop towel management policy so soiled wipers are stored in closed or covered safety containers to reduce air emissions	5	6	▲	35	35	□
Instituted a program to recover free liquids from shop towels either on-site or off-site, (i.e., gravity draining via false bottom collection drums, hand wringers, centrifuges, etc.)	2	6	▲	7	7	□
Implemented a solid waste/recycling program by recycling all possible items from solid waste stream	7	7	□	24	23	▼
Reused and recycled pallets and skids to reduce solid waste	8	8	□	31	31	□
Collected and recycled used oil, other lubricants, and batteries	4	4	□	19	20	▲
Recycled parts washing fluids	4	4	□	8	9	▲
Implemented a program to manage and recycle spent fluorescent and high-intensity-discharge lamps	2	5	▲	24	29	▲
Where possible, used low-solvent, no-solvent, or water-based adhesives and glues	5	6	▲	14	17	▲

Where possible, used low-solvent, or water-based ink-jet inks	1	1	☐	13	16	▲
Requested that the vendor take back all samples not consumed	7	7	☐	10	14	▲
Used first-in, first-out inventory control system	8	8	☐	33	35	▲
Covered all open containers of liquids and kept them closed	8	8	☐	38	39	▲
Stored all materials to minimize damage from mishandling or accidents	7	7	☐	39	39	☐
TOTAL	**130**	**147**	▲	**536**	**553**	▲

* Indicates that the question asked in Missouri and New Hampshire differs slightly. In Missouri, the printers were asked whether they "investigated the use" of a particular pollution prevention activity. In New Hampshire, the printers were asked whether they "used" a particular pollution prevention activity.

Note: The "n/a" indicates that the question was not asked on the PrintSTEP Application.

Source: Missouri and New Hampshire PrintSTEP Applications.

As seen in Table 15, while new pollution prevention practices were adopted during the PrintSTEP pilot, a few shifts away from some activities also occurred. The last row of Table 15 summarizes this information, showing overall increases in pollution prevention activities during the pilot for printers in Missouri and New Hampshire. Much of this increased activity can be attributed to the direct, on-site technical assistance provided by the PrintSTEP Coordinators, resulting in greater awareness of potential pollution prevention actions. It was also observed that printers who discontinued a pollution prevention practice often had an accompanying elimination of the associated process or equipment at their facility (e.g., silver recovery was no longer used because the printer switched to digital processing and no longer had silver at the facility). Lastly, many PrintSTEP printers were already practicing pollution prevention when they joined the pilot as would be expected from facilities interested in a voluntary program focused on environmental protection.

It was beyond the scope of this study to evaluate whether non-PrintSTEP printers or the sector as a whole changed pollution prevention practices during the same time period.

Regulatory Compliance

Compliance improvements were reported during the PrintSTEP pilot. All but one of the printers in NH were out of compliance prior to joining PrintSTEP. As a result of PrintSTEP, all participants were brought into compliance. The specifics, per pilot state, are discussed below.

In Missouri, the SAG set a requirement that printers applying to PrintSTEP could not have ongoing compliance issues, as a few interested printers did. These issues were resolved before printers joined the program.

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- Two printers were discharging silver in concentrations that exceeded the Metropolitan Sewer District limits; these discharges were discovered during the on-site visits. Both facilities had silver capture systems but both had accumulated silver in the lines. After the site visit, the lines were cleaned out. Both printers then changed their prepress workflow and work practices to avoid having to do this again.
- Two printers had storm water permits and were paying storm water fees, but didn't have exposed materials and thus did not require a permit. As a result of PrintSTEP, the permits were rescinded to save the printers and Missouri DNR staff the associated permit renewal fees, paperwork, and administrative time required.

Other waste management problems were resolved through PrintSTEP that were not related to compliance. These problems included assistance to a printer in finding a cost-effective local water-testing laboratory that was approved by the local sewer district and assistance to the city of St. Louis (through the MOU) in resolving an odor complaint against a local printer.

In New Hampshire, all but one of the participating printers were out of compliance at the start of the pilot, primarily related to their RTAP (regulated toxic air pollutant) emissions, storm water, and hazardous waste requirements. These issues, described below, were resolved before or immediately after printers joined the program.

- Most printers had not completed their RTAP demonstrations or their "no exposure" certification for storm water.
- For hazardous waste, many printers didn't know how to characterize their waste or were mischaracterizing their waste, and some printers generating hazardous waste did not have RCRA ID numbers. For example, many printers had questions on the waste classification of metal-containing inks.
- The most frequent RCRA compliance violations were improper labels or absence of labels on waste drums, and improper labeling of waste rag containers.
- For air compliance, recordkeeping to determine annual usage of raw materials was found lacking. Compliance with the New Hampshire DES requirements was too complex for most printers, and PrintSTEP and NHDES were able to provide direct technical assistance.
- One printer was discharging waste water to the septic system and needed to install treatment equipment.

Assistance from PrintSTEP during the application phase brought these facilities into compliance. Further, the process also greatly improved the printers' awareness levels regarding environmental issues. This awareness included reviewing materials before purchasing materials and properly disposing of expired materials or materials the companies no longer used.

During the endpoint telephone survey, printers were asked whether they thought their compliance had improved as a result of PrintSTEP. Overall, 86% of printers replied that their compliance improved, as shown in Table 16.

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Table 16: Printers' View of Their Change in Compliance Status During PrintSTEP		
State	Compliance Improved	Compliance Did Not Improve
Missouri	83% (5/6)	17% (1/6)
New Hampshire	87% (26/30)	13% (4/30)
TOTAL	**86% (31/36)**	**14% (5/36)**
Source: PrintSTEP pilot endpoint telephone survey of participating printers.		

It is beyond the scope of this study to evaluate whether the non-PrintSTEP printers or the sector as a whole changed compliance practices during the same time period.

Summary Assessment of Findings on Environmental Protection and Practices

Assessing all pilot parameters as a whole, improvements were observed in some areas while in others little or no change was seen. A greater percentage of facilities reduced air and hazardous waste emissions in the PrintSTEP group than did in the general population of the two states, when corrected for activity level. Other environmental areas were assessed for the PrintSTEP group but not compared with the same areas of nonparticipating printers. For these areas, meaningful changes in performance on waste water and storm water were not seen; however, these areas are not typically the printing sector's primary environmental concern. An increase in pollution prevention activity of an average of 5% in the pilot states was observed. For all of these parameters it should be noted that only a small number of data points were available, in some cases as small as three (e.g., for New Hampshire non-PrintSTEP air emissions data). Lastly, an all-around improvement in compliance and awareness of environmental requirements for all participating printers was clearly seen. This improvement will undoubtedly have future positive impacts in terms of better waste management and recordkeeping practices.

Several PrintSTEP printers in Missouri grew considerably during the pilot, consequently increasing their waste streams. This growth was not always effectively or entirely normalized by the Production Activity Index (PAI) provided by the facilities. For example, one printer added two large presses and increased production considerably, as measured in tons. However, the company cut prices and its profit margin went down at the same time, reflecting the increasingly competitive nature of the industry. This company selected a PAI at the start of the pilot based on sales, which did not ultimately reflect the changes at the facility that would affect environmental releases. The PrintSTEP Coordinators observed that, in many cases, when printers joined the PrintSTEP program they also performed significant housekeeping and cleanouts that could conceal real changes in waste quantities from baseline to endpoint.

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ImpactonEfficiencyofthePrintSTEPProcessforPrinters

This section presents information on the administrative efficiency of PrintSTEP for printers. The findings are based on phone interviews with the participating printers, as well as interviews with the state PrintSTEP Coordinators.

Two of the four pillars of PrintSTEP were designed to directly improve the efficiency of the regulatory process for printers. These pillars are presented here:

- **Regulatory Simplification**. With PrintSTEP's multimedia approach, printers' waste water, hazardous waste, storm water, and air requirements are all covered in one package. In designing PrintSTEP, regulatory simplification was intended to improve environmental performance while also making the process less time-consuming for printers.
- **Operational Flexibility.** When a printer makes a process change under PrintSTEP, in many cases, no approval is required. If the change does not result in an alteration to the printer's PrintSTEP levels, the changes needed to respond to market demands can be made without waiting for a lengthy approval process.

The following sections address the question of how efficient the PrintSTEP participants found the program to be, and whether it achieved the improved efficiency goals set forth in the program design.

Understanding of Environmental Requirements

Changes in printers' understanding of environmental requirements were assessed. Printers were asked to assess their understanding of the environmental regulations before and after PrintSTEP. All printers felt they had gained a better understanding of their requirements during their participation in the pilot. The PrintSTEP Coordinators confirmed this improvement. Through the application process and the PrintSTEP materials, the participating printers improved their understanding of their environmental requirements.

At the beginning of the pilot, PrintSTEP printers were asked to characterize how well they understood their environmental requirements. At the endpoint, printers were asked to think back and characterize how well they had understood their requirements prior to joining PrintSTEP. Looking back, few printers thought they had had a good understanding of the requirements, as shown in Table 17. Considering air, hazardous waste, waste water, and storm water requirements, printers said they had least understood the air requirements prior to joining PrintSTEP, with only 19% reporting they had had a "very good" or "fairly good" understanding. The PrintSTEP Coordinator noted that the noncompliance issues at the start of PrintSTEP were mainly related to air (primary the New Hampshire RTAP requirements) or storm water requirements, and this observation was confirmed by the responses presented in Tables 17 and 18.

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Table 17: Percentage of Printers with a Good Understanding of their Environmental Requirements Prior to PrintSTEP			
	Missouri	New Hampshire	Total
Air	17%	20%	19%
Storm Water	17%	27%	25%
Waste Water	50%	47%	47%
Hazardous Waste	67%	50%	53%
Source: PrintSTEP pilot endpoint telephone survey of participating printers.			

Printers had been asked this same question about their level of understanding of their environmental requirements two years earlier prior to joining PrintSTEP. At that time, many more printers *thought* they understood the requirements. Only after their PrintSTEP participation did they realize that they had not fully understood the requirements. In other words, they didn't know what they didn't know. This change in their perception was the case for every medium, and in both states, but again, was most pronounced for air requirements, as shown in Table 18, representing the responses for both Missouri and New Hampshire combined.

Table 18: Change in Printers' Perception of Initial Understanding of their Environmental Requirements Prior to PrintSTEP			
	% of printers who thought their pre-PrintSTEP understanding was "Good" prior to joining PrintSTEP	% of printers who thought their pre-PrintSTEP understanding was "Good" after two years in PrintSTEP	Difference
Air	49%	19%	-30%
Storm Water	45%	25%	-20%
Waste Water	71%	47%	-24%
Hazardous Waste	71%	53%	-18%
Source: PrintSTEP pilot baseline and endpoint telephone surveys of participating printers.			

The PrintSTEP Coordinators noted that this increased understanding goes beyond regulatory requirements, stating that the PrintSTEP process not only brought the printers into compliance, it also greatly improved their "awareness level" regarding environmental issues. This awareness included knowing to review materials before purchasing them and disposing of expired materials that are no longer used.

When asked why they didn't initially understand the requirements, the reason given most often for all media by the printers was that they were unaware of the regulations. The types of comments received from the printers include the following:

- "At the start of the program, [I was] not sure there were any air requirements."
- "We didn't know we were using hazardous materials."
- "I was new to the industry and didn't think about [the requirements] before PrintSTEP."

Ability to Respond to Business Opportunities

Operational flexibility was one of the pillars of PrintSTEP, and the evaluation sought to determine if PrintSTEP had been successful in providing operational flexibility. The baseline interviews at the start of PrintSTEP revealed that environmental requirements had impeded a business opportunity for only one printer. In the interviews conducted with participating printers two years later, one printer reported that his facility's participation in PrintSTEP enabled the company to quickly and easily respond to market conditions. Additionally, other printers did install new equipment without having to wait for state approval. Further details on situations where PrintSTEP positively impacted business opportunities can be found in the next paragraphs.

In Missouri, one printing facility was able to install an additional sheetfed lithographic press much more quickly than it could have, had the company not been a PrintSTEP participant. The facility first contacted the PrintSTEP Coordinator, who consulted the city's air permit chief. The air permit chief agreed that the new press could be covered under the existing PrintSTEP Agreement. The emissions from the new press were calculated to be 3 tons per year (tpy). Prior to the press installation, the facility's VOC emissions were 12 tpy, thus the additional 3 tons brought the company's total up to a total of 15 tpy. The facility was at PrintSTEP Air Level 2, which covers emissions up to 20 tpy. The PrintSTEP permit process took a total of three days, instead of an estimated three months under the traditional regulatory system. This efficiency saved the facility, state agency, and the city time and expenses in not having to formally undertake the traditional permitting approval process. It was also beneficial that the company had a single point of contact so it was able to find out easily what it did or did not need to do.

Another printer added four flexographic presses during the pilot program. This printer also changed to "zero VOC" inks and did not change their air emissions from the printing operations. A third printer exchanged printing presses in a "like-for-like" swap. The new press was more modern and had greater capacity, but did not increase the air emissions. The process for these facilities only took two days for each permit modification.

In all three situations, the printers remained within the same PrintSTEP air level, therefore, the permit modifications only required a visit from the PrintSTEP Coordinator. Under the traditional regulatory system, these permit modifications could have taken as much as three months and resulted in a 200-page permit request to the state. Instead, the process took only two or three days and saved the facility, the state, and the City of St. Louis the time and expense of the formal permitting process.

Further, some of the participating printers did receive approval of their PrintSTEP Notification or Agreement more quickly than approvals had been received under the traditional regulatory system, as shown in Table 19; an equal number saw no change in the turnaround time.

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Table 19: Difference in Turnaround Time between PrintSTEP and the Traditional Regulatory System	
PrintSTEP Comparative Turnaround Time	Percentage of Printers
Shorter	47% (16/34)
About the Same	47% (16/34)
Longer	6% (2/34)
Source: PrintSTEP pilot endpoint telephone survey of participating printers.	

Most of the participants received a PrintSTEP Notification, rather than an Agreement, which does not require an official "approval" from the state agency. These printers for the most part did not have any permits or environmental approvals prior to PrintSTEP either, so it is to be expected that they would not see a significant difference between the two systems.

Value of a Multimedia Approach

The multimedia approach is a key design element of PrintSTEP, contributing to how the "regulatory simplification" pillar is implemented, as well as providing a holistic view of wastes to encourage implementation of the "pollution prevention" pillar. In addition to simplifying and consolidating printers' cross-media regulations, PrintSTEP further implemented a multimedia approach by assigning PrintSTEP Coordinators, who served as a single point of contact to respond to printers' multimedia questions.

Prior to joining PrintSTEP, some of the participants dealt with multiple state contacts for their different environmental media questions and requirements. Only one printer in Missouri and three in New Hampshire identified a single source they could contact for environmental information in their state. Results from the baseline interviews showed that nine printers in New Hampshire (22% of respondents) did not have multimedia releases and therefore did not initially feel the need for a multimedia point of contact. As discussed previously, however, many printers were unaware of their environmental requirements prior to their participation in PrintSTEP. Overall, a majority of printers saw an advantage in having a single point of contact to assist them.

During the course of the pilot, almost all of the printers contacted the PrintSTEP Coordinator, and more than 90% were satisfied with the information they received, including 80% who said they were "very satisfied," as shown in Table 20.

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Table 20: Percentage of PrintSTEP Printers Who Contacted Their PrintSTEP Coordinator and Satisfaction Rates						
	Percentage of Printers					
	Missouri		New Hampshire		Total	
	First Year	Second Year	First Year	Second Year	First Year	Second Year
Participants Who Contacted Their Coordinator	100% (8/8)	83% (5/6)	87% (33/38)	48% (15/31)	89% (41/46)	54% (20/37)
Participants **Very Satisfied** With Response	100% (8/8)	100% (5/5)	76% (25/33)	93% (14/15)	80% (33/41)	95% (19/20)
Participants **Somewhat Satisfied** With Response	0%	0%	15% (5/33)	7% (1/15)	12% (5/41)	5% (1/20)
Participants **Somewhat Unsatisfied** With Response	0%	0%	9% (3/33)	0%	7% (3/41)	0%
Participants **Very Unsatisfied** With Response	0%	0%	0%	0%	0%	0%
Source: PrintSTEP pilot midpoint and endpoint telephone surveys of participating printers.						

In the first year, a few New Hampshire printers said they had not been satisfied with the information they received when they contacted their PrintSTEP Coordinator. These printers stated the following reasons for their dissatisfaction:

- "Spoke with different contacts. No cohesive follow-up."
- "I didn't think program was applicable to my facility."

During this time, changes in staffing for PrintSTEP in New Hampshire likely affected these comments.

In both states, those facilities that did not contact the PrintSTEP Coordinator said no situations arose where help was required.

During the second year of the pilot, about one-half of the participants contacted their PrintSTEP Coordinator, and all were satisfied with the information received. It is important to note here, as with other interview information, that the decrease in response rate for the endpoint survey is likely to have affected these results.

Printers were also asked what effect the multimedia coordination at the state agency had on the turnaround time of the regulatory process. One-half of the Missouri printers and 35% of the New Hampshire printers commented that PrintSTEP's multimedia coordination at the

state agency sped up the regulatory process for them. Most printers thought PrintSTEP had no net effect on the timing of the regulatory process, as shown in Table 21.

Table 21: Impact of the PrintSTEP Coordinators in Expediting the Regulatory Process		
PrintSTEP Coordinator Impact	Percentage of Printers	
	Missouri	New Hampshire
Sped up the regulatory process	50% (3/6)	35% (8/23)
Had no effect on the speed of the regulatory process	50% (3/6)	65% (15/23)
Source: PrintSTEP pilot endpoint telephone survey of participating printers.		

In addition to tracking how many printers were in touch with the PrintSTEP Coordinator, the outcome of this contact was assessed qualitatively. Contact with PrintSTEP Coordinators often led to improvements at facilities, demonstrating the benefits of a multimedia regulatory approach in terms of both environmental quality and time/money. For example, during the initial application process, the Missouri PrintSTEP Coordinator toured each facility to review and advise the printers on their permitting, air quality, hazardous waste, solid waste recycling, waste water, and storm water procedures. In New Hampshire, however, the PrintSTEP Coordinator judged that state's pilot program should have met more often with participating printers. "The single point of contact is very important to help printers resolve their issues."

One unexpected significant occurrence was the change in New Hampshire's hazardous waste requirements during the PrintSTEP pilot. Both the New Hampshire PrintSTEP Coordinator and one of the PrintSTEP printers mentioned this problem as a major drawback. After the PrintSTEP pilot had started, New Hampshire implemented a Small Quantity Generator (SQG) Self-Certification Program that required additional action on every printer's part. This state requirement was not in effect at the time PrintSTEP was customized for New Hampshire; therefore it was not incorporated into the PrintSTEP workbook or other aspects of the pilot. When the SQG program came into effect, PrintSTEP was no longer a comprehensive multimedia program for many printers as it did not include these new requirements. Several printers voiced complaints about this situation, saying it caused confusion, given that PrintSTEP was advertised as a multimedia program.

It should be noted, however, that the PrintSTEP participants, as a result of being involved in PrintSTEP, received tailored one-on-one assistance to ensure their compliance with this new state requirement; this would not have occurred in the same manner had they not been involved in PrintSTEP.

Costs for Printers

This section discusses participants' time spent on PrintSTEP recordkeeping and reporting requirements as compared to their time spent on these activities prior to joining PrintSTEP. What could not be quantified are the potential costs which printers were able to avoid as a result of PrintSTEP, including but not limited to: potential consulting fees, fines, lost

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production due to permit delays, and the additional time spent learning environmental requirements without one-on-one assistance.

Missouri printers did see some reductions in their time requirements, with 67% spending less time on reporting under PrintSTEP, but most showing no improvements in their time spent on recordkeeping, as shown in Table 22. In New Hampshire, approximately one-half of the printers saw no change in the time spent on recordkeeping and reporting, while a fair number said their time spent was greater under PrintSTEP, and a few said their time decreased.

Table 22: Change in Participants' Time Spent on PrintSTEP, as Compared with the Traditional Regulatory System

	Percentage of Participants					
	Missouri			New Hampshire		
	Decreased	Remained the Same	Increased	Decreased	Remained the Same	Increased
Time Spent on Recordkeeping	33% (2/6)	50% (3/6)	17% (1/6)	6% (2/31)	52% (16/31)	42% (13/31)
Time Spent on Reporting	67% (4/6)	33% (2/6)	0%	13% (4/31)	55% (17/31)	32% (10/31)

Source: PrintSTEP pilot endpoint telephone survey of participating printers.

Printers were also asked to quantify how much their time increased or decreased for these activities under PrintSTEP when compared to their requirements prior to joining PrintSTEP. On average, PrintSTEP printers spent 12% more time on recordkeeping under PrintSTEP, and 6% more time on reporting, as shown in Table23.

Table 23: Magnitude of the Change in Participants' Time Spent on PrintSTEP, as Compared with the Traditional Regulatory System

	Average Percentage Change	Range of Change
Time Spent on Recordkeeping	+12%	30% less to 100% more
Time Spent on Reporting	+6%	50% less to 100% more

Source: PrintSTEP pilot endpoint telephone survey of participating printers.

When asked why PrintSTEP took more time, printers generally stated that the additional time was needed because previously they had spent so little time on their environmental requirements. Almost all printers responding to this question indicated that the additional time was worthwhile. Some of the responses included the following:

- "We weren't doing much before, and now we have been keeping better records."
- "We were unaware of regulations at first, so there was a big increase at first, but now it's not that burdensome since I know what I did before."
- "I'm more aware of chemicals going in and out of facility and want to keep better track of what's coming in and out."

- "No one was keeping track of things being filed properly before. I maybe spend 30 minutes a month on it now, which is probably more than was done in the past, since I don't think anyone was really keeping records."

Note that many of the participants were not complying with the environmental requirements prior to PrintSTEP and, as such, had spent little or no time on recordkeeping or reporting. After joining PrintSTEP and coming into compliance, their time spent on these activities increased. For example, in New Hampshire, most printers had not completed their RTAP calculations as required by the state. After joining PrintSTEP, they did learn of and complete their RTAP calculations. This step was perceived by some printers as an additional requirement that they had not performed under the traditional regulatory system, although they should have. One printer who said his time spent on recordkeeping and reporting increased by 80% explained that this increase was primarily owing to the RTAP calculations.

Additionally, for the purposes of this evaluation, PrintSTEP participants were required to submit updated RTAP calculations in 2005 for calendar year 2004. This was required only for the pilot evaluation. For all other years, and for non-participating facilities for all years, annual RTAP emissions are only required to be reported for sources that require permits. Some printers saw this as an additional burden.

Another reason that printers did not generally see reductions in the time spent on their environmental recordkeeping and reporting requirements could have to do with constraints in the implementation of PrintSTEP. For example, the nature of the media-specific fee collection in each state could not be altered. Media-specific programs are funded through fee collection, and fees are collected when reports, such as hazardous waste reports, are submitted. Media-program offices within the state agencies could not allow PrintSTEP to collect the fees or associated reports. As a result, PrintSTEP printers with multimedia requirements still had fees and reporting due at various times throughout the year; this reduced the potential benefits of PrintSTEP that could have been realized if the state agencies had been able to consolidate the collection or fees and/or reports, part of the original design of PrintSTEP.

Summary Assessment of the Efficiency of PrintSTEP for Printers

One of the goals of the designers of PrintSTEP was to offer a streamlined method for printers to address their environmental requirements. This concept of improved "efficiency" encompasses many facets, including the following:

- An easy way for printers to learn about and understand their environmental requirements for all media.
- Improvements in the regulatory process that would allow printers to respond to business opportunities more quickly.
- A multimedia approach that encourages a holistic view of operations so the impacts of any changes are considered across media.

- A process in which recordkeeping and reporting requirements are less time-consuming for printers.

In some of these areas, PrintSTEP offered significant improvements, while in others the pilot had little effect. A summary of each aspect of efficiency for printers follows.

Printers clearly gained an increased understanding of their multimedia environmental requirements. This understanding was their primary motivation for joining the pilot and their improved compliance and responses to the survey questions demonstrate that their understanding did improve.

The PrintSTEP pilot demonstrated that the program has the *potential* to allow printers to respond to business opportunities more quickly. The concept of allowing for operational flexibility and how it was implemented in PrintSTEP appears sound. It may well be a more sought-after or valuable feature in sectors where changes that impact emissions occur more frequently.

Regarding the "holistic view of operations," participants noted a significant value in having a designated PrintSTEP Coordinator in each pilot area. Almost all participants contacted their Coordinator at some point during the pilot; the vast majority were satisfied with their interactions. In several cases, this interaction led to regulatory or environmental improvements.

With regard to time requirements, Missouri printers did see some reductions, with 67% spending less time on reporting under PrintSTEP, although most printers saw no change in the time spent on recordkeeping. In New Hampshire, approximately one-half of the printers saw no change in the time spent on recordkeeping and reporting, while a fair number said their time spent was greater under PrintSTEP, and a few said their time decreased. This finding may be the result of three factors: a) many printers were not meeting their environmental recordkeeping and reporting requirements prior to PrintSTEP and as a result, did not spend any time on these activities prior to the pilot; in fact, almost all of the printers responding to questions indicated that the additional time spent on environmental requirements under the pilot was worthwhile; b) because of constraints within state organizations, there were still some media-specific reports and fees due at various times throughout the year which could not be consolidated; and c) in one pilot state, a new state requirement (the NH SQG self-certification) was introduced after the pilot was launched.

Additionally, most printing facilities are small and are not required to obtain permits such as state operating permits for their air emissions. These types of facilities have not experienced lengthy or time-consuming permit approval processes. The streamlined aspects of PrintSTEP, therefore, were not seen as a benefit by such facilities. A streamlined program like PrintSTEP could expect to see greater efficiency improvements in industry sectors in which more multimedia regulatory reporting and approvals are required.

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Impacton EfficiencyofthePrintSTEPProcessforStateGovernments

Interviews were conducted with key staff at each state's environmental agency both at the baseline and after pilot implementation. Interviews focused on assessing the pre-PrintSTEP organization of the state agency and the procedures and level of effort required from the state's perspective to administer a sector-based, multimedia program as compared with a standard media-based approach.

Improvements inherent in the PrintSTEP objective of regulatory simplification, which is one of the pillars of PrintSTEP did have positive impacts on states.

- **Regulatory Simplification**. If regulations are simplified for the regulated community, it will also be simpler for state personnel to administer. In addition, EPA provided a state guide on PrintSTEP to each participating state which they tailored to reflect state/local requirements, as applicable, as well.

Efficiency in Missouri Pilot

In Missouri, interviews were conducted with staff from the Air and Land Protection Division, Hazardous Waste Program, Water Pollution Control Program, and Air Pollution Control Program.

Organization of Missouri DNR

In Missouri DNR, media programs are compartmentalized with some single-media units working together on cross-media activities. Those mentioned during the staff interviews included the following:

- **Multimedia inspections** coordinated by inspectors in the St. Louis regional office who are cross-trained. In these instances, Missouri DNR personnel stated that facilities seem to appreciate the cross-media coordination, as it appears to be less time consuming for them.
- **Technical assistance programs (TAPs)** in the state designed to address multimedia concerns, including multimedia environmental compliance inspections and an institutional enforcement coordinating committee that crafts multimedia enforcement solutions.
- **"Concurrence of Action" forms** that allow different permit programs to inform and obtain permission from each other for multimedia actions.

For general questions and very basic permitting questions (e.g., questions about whether a permit was required), printers can call the TAP. Small businesses typically call for general information. For more specific questions they are referred directly to the individual programs' staff. Because the Air and Land Protection Division covers permitting for all programs, this division is the de facto contact for multimedia questions, including permitting. The group serves as a permit Coordinator to help companies figure out which media permits they may need and refers them to the appropriate permitting staff and to the TAP. This function is

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publicized by other Missouri DNR program staff members, who call the division if they learn of a facility that may have multiple permitting issues. Before the implementation of PrintSTEP no specific point of contact existed for printers. Under the pilot program, the PrintSTEP Coordinator served as that single point of contact, but only for the St. Louis region as that is the designated pilot area. Other agencies were involved with PrintSTEP, including the Metro Sewerage District, the St. Louis City Air Pollution Control Division, the St. Louis County Health Department, the EPA Region 7, the Air Conservation Commission, and local counties and cities.

Comparison of the Traditional Missouri DNR Structure with the PrintSTEP Program
The existing regulatory system at the Missouri DNR was described by media office staff in the following manner:

Air. Missouri air permits include the following:

- General Permit. This permit is used for industry sectors as a group, but no general permit exists for printers.
- Basic Permit. This permit is for facilities for which potential emissions are below a major source threshold.
- Intermediate Permit. This permit is for facilities for which potential emissions are greater than a major source threshold, but facilities elect to take restrictions to keep emissions below that threshold. This permit is similar to a Federally Enforceable State Operating Permit (FESOP).
- Title V Permit or an Intermediate Permit (can apply for either type of permit). Facilities with a Title V Permit can increase emissions up to the regulatory limit rather than having an artificial cap. It is harder to expand operations with an Intermediate Permit; there may be as much as a 180-day delay. With Title V, however, compliance assurance monitoring measures have to be put in to provide a higher degree of certainty. In contrast, the Intermediate Permit requires additional record keeping to prove that the facility's emissions are below the major source threshold.

Waste Water. In Missouri, one state agency staff member is responsible for industrial pretreatment permits for the state. Printers in the pilot area discharge to POTWs; no direct dischargers exist. Most printers in Missouri would not be expected to have a permit from a POTW. Statewide, only seven or eight printers are SIUs and would therefore be permitted by a POTW and undergo inspections. Non-SIUs would not have a permit. No categorical pretreatment standards are in place for printers; thus the POTW sets the standards. POTW rules differ by county.

Storm Water. At least two printers in the pilot area held general permits for storm water prior to the start of the PrintSTEP pilot. The state-level industrial pretreatment person interviewed did not know whether additional printers in the pilot area held storm water permits.

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Hazardous Waste. Hazardous waste permits in Missouri are only issued for treatment/storage/disposal (TSD) facilities. Facilities that generate hazardous waste register, obtain an ID number, and pay fees. The Missouri hazardous waste categories are slightly more stringent than the federal categories.

Consolidation. Across all media programs, limited reporting consolidations were available to PrintSTEP printers during the pilot. Printers still have their monthly sewer bills, state storm water fee, and air and waste fee. However, on-site compliance assistance assessments (conducted by the PrintSTEP Coordinator) were consolidated across media and such assessments proved to be very helpful in identifying areas for environmental improvements.

Costs for Missouri DNR. Missouri estimated the time it takes to process a standard construction permit for printers the size of those included in PrintSTEP. This estimate is compared with the time it took to implement the PrintSTEP pilot per printer in St. Louis, MO. Table 24 displays the estimates.

Table 24: Total Estimated State Staff Time to Implement the PrintSTEP Pilot per Printer in St. Louis, MO
Total **estimated** time for implementing PrintSTEP per printer in St. Louis, MO. Notifications: 69 hours/printer Agreements: 132 hours/printer
Total **estimated** time for processing standard permits in Missouri Water (typically not applicable to printers): 12 hours/printer Air (occasionally applicable to printers): 20 hours/printer
Source: Interviews with PrintSTEP Coordinator.

Table 24 reflects the approximate time it took for the state PrintSTEP coordinator to complete the following types of activities:

- Soliciting printers, conducting workshops and hearings, reviewing Applications and setting up the Repository;
- A visit to each interested facility at least twice, with the second visit to work with the printer to complete the printer's Application and provide other on-site environmental assistance;
- Developing, drafting and finalizing Notifications and Agreements; and
- Completing MOUs with city air, county air, and sewer departments.

Table 24 also reflects the time it takes to process standard construction permits in MO for printers the size of those included in PrintSTEP; the activities encompassed within that time estimate include the following:

- Responding to questions regarding obtaining a construction permit;
- Logging the application and checking for completeness by the initial review unit (when the 90 day clock starts);

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- Submitting the application into the queue for technical review;
- Reviewing the application for potential and expected emissions levels and, if emissions levels indicate, modeling ambient pollutant concentrations beyond the fenceline; the review includes additional questions and clarifications as needed by the staff;
- Drafting the permit and setting any operating or performance conditions as necessary;
- Providing the draft permit to the applicant for review; and
- Issuing the permit.

It should be noted that MO charges the printer a fee per hour it takes to process the permit application; as a result, there is a built-in incentive for the printer to provide all the required information up-front thereby reducing the time it takes to process the standard construction permit.

As shown above, the activities reflected in the PrintSTEP estimate are much broader than the activities encompassed in processing a permit under the traditional system.

The PrintSTEP Coordinator assessed that the time required of the state would decrease dramatically were a printer joining PrintSTEP today. Because the PrintSTEP Coordinator was working on a process that was under development, every time a different issue arose the Coordinator had to consult with the SAG to determine how to proceed. This learning curve would not apply in the future. However, some efficiencies were seen, including the ability to focus only on those issues relevant to a particular printer's specific processes. Being familiar with printing processes as the Coordinator was, the Coordinator did not need to ask about every piece of equipment; a permit writer unfamiliar with the sector might have to do this.

Efficiency in the New Hampshire Pilot

For the evaluation, interviews were conducted with staff from the New Hampshire SBTAP and pollution prevention, water pollution, enforcement, outreach, air, and waste management programs, all of which are located in the New Hampshire DES (NHDES) offices in Concord, New Hampshire.

Organization of NHDES

Each media program within NHDES operates separately. However, some cross-media activities do occur. Those mentioned during the staff interviews included the following:

- **Cross-media initiatives** with individual sectors in specific areas, primarily driven by SBTAP. For example, work was undertaken with the automotive sector in compliance, pollution prevention, and best management practices. Other multimedia efforts have involved dry cleaners, hospitals (for mercury), and spray-booth operations.
- **Cross-media inspections** occurring approximately six times per year. For these inspections, the separate media programs collaborate on targeting and performing the inspection. The time needed for multimedia inspections has been reduced and is now almost the same as that required for separate inspections. The time required of the facility is roughly the same.
- **Compliance assistance efforts** of the pollution prevention group often have a cross-media focus. The outreach/communication Coordinator's activities are often multimedia.

Given the fact that the DES is organized by media, no single point of contact for printers existed before the creation of the PrintSTEP Coordinator role. In the past, for this type of assistance small printers contacted the municipality and larger permitted printers contacted the person listed on their permit. Others would contact the DES main number or the public information center. Referrals to the pollution prevention group are also sometimes provided during inspections or in letters of deficiency, as the pollution prevention group has a multimedia focus.

Comparison of the Traditional NHDES Structure with the PrintSTEP Program

The existing regulatory system at the New Hampshire DES was described by DES staff in the following manner:

Air. In the traditional regulatory system, every facility must determine whether its potential emissions are less than the state thresholds for criteria pollutants and air toxics (known as regulated toxic air pollutants or RTAPs). Where the facility exceeds a threshold, a permit is required. If a facility's potential emissions for criteria pollutants are greater than the state threshold but lower than the federal threshold, an operating permit (Federally Enforceable State Operating Permit) is required. The FESOP must be renewed every five years. The state usually processes applications in less than 90 days. The backlog of permits to be processed is significant because the renewal process for facilities that have had operating permits includes updating emission information, additional modeling, etc. If a facility's potential emissions of criteria pollutants or an air toxic are greater than the applicable

federal threshold, a Title V permit is required. Only a few printers in the state have a Title V permit. If a facility makes modifications that increase its potential emissions, it may need to apply for a FESOP or a Title V permit. Both the FESOP and the Title V permits require public notice. When a facility with a FESOP plans modifications that increase emissions, the modification goes through the same process as a new application, including public notice and an opportunity for public meeting, if requested.

An RTAP evaluation which includes calculating daily and annual emissions of RTAP chemicals used at the facility is required for all businesses using any RTAP chemical. However, facilities are not required to submit the data to the state unless the levels are greater than the threshold levels for a permit. Most printers do use one or more RTAPs below threshold level; however, prior to PrintSTEP, they had not completed their required RTAP evaluation. Once they joined PrintSTEP, all printers were to complete their RTAP demonstrations and submit the calculations with their Applications. Note that the RTAP demonstration requirement was not new or specific to PrintSTEP, although some printers viewed it as such because they had not completed the calculations previously. As a result, some printers considered this process to be a burdensome aspect of PrintSTEP, when actually it was an existing state requirement prior to PrintSTEP.

Waste Water. Most printers discharge to POTWs. Municipalities with POTWs may set discharge limits for individual facilities, and facilities discharging to the POTW are required to pay a fee. The process is controlled locally; consequently, the requirements (such as pollutant limits and the process for making changes in place) will vary among municipalities. Printers in areas without a POTW typically ship their waste water off-site for treatment, in which case management of their waste water falls under the hazardous waste regulatory system. No printers in the state are known to be direct dischargers.

Storm Water. New Hampshire has not taken full delegation of the EPA's NPDES storm water program. Therefore, the state handles outreach and assistance, but EPA Region 1 handles permits. No printers are known to have a NPDES storm water permit in the state. Thus, the regulatory system for both PrintSTEP and non-PrintSTEP printers is the same.

Hazardous Waste. Every facility generating hazardous waste must obtain an EPA identification number. Based on the quantity of hazardous waste generated, a facility will fall into one of several generator status categories. Generator status determines reporting, storage, and other requirements. Most printers are hazardous waste generators and should have an RCRA ID number. If a facility increases its hazardous waste generation to the point that its generator status changes, it must notify the state.

Consolidation. Some consolidation of reporting requirements was possible in New Hampshire. With respect to waste water, only the three Agreement printers had waste water sampling requirements, and New Hampshire was successful in combining the waste water report with the annual PrintSTEP report. This consolidation reduced one printer's reporting

requirement from quarterly to annually. The other two printers had annual reporting requirements so no real reduction in quantity of reports occurred; however, the printer could combine all required reporting in one report and submit it to DES and the local POTW. For hazardous waste, all facilities generating hazardous waste are required to submit quarterly activity reports. When the state receives hazardous waste manifests, it develops a report of all activity for that facility. The state then sends the report to the facility on a quarterly basis to verify the information, and the facility submits its fee. The state employs the same process for the biennial reporting required under RCRA for LQGs. The PrintSTEP program was not able to consolidate quarterly hazardous waste reporting requirements because these reports are required by state statute. The state's new SQG Self-Certification[9] program and the Hazardous Waste Coordinator Certification program for full quantity generators (FQG)[10] are not included in the PrintSTEP program, as these programs were introduced after PrintSTEP was implemented.

Cost for NHDES. New Hampshire estimated the time it takes to process a standard air permit for printing facilities; only air permits would apply to New Hampshire printers. This time is compared with the estimate for implementing the PrintSTEP pilot per printer in NH and shown in Table 25.

Table 25: Total Estimated State Staff Time to Implement the PrintSTEP Pilot per Printer in NH
Total **estimated** time for implementing PrintSTEP per printer in New Hampshire Notifications: 72 hours/printer Agreements: 126 hours/printer
Total **estimated** time for processing standard permits in New Hampshire Air (occasionally applicable to printers): 59 hours/printer
Source: Interviews with PrintSTEP Coordinators.

The type of support provided by the PrintSTEP Coordinator during the PrintSTEP Application process and reflected in the table above includes the following:

- Contacting printers;
- Reviewing Applications for completeness;
- Contacting printers for missing support materials;
- Assisting printers with their RTAP evaluations;
- Conducting site visits to assist printers in completing their Applications;
- Developing, drafting and finalizing Notifications and Agreements;

[9] Under the Small Quantity Generator Self-Certification Program, each SQG reviews its hazardous waste management procedures, conducts a self-inspection of its facility, and certifies compliance to DES every three years.

[10] A FQG generates, in any one month, more than 220 pounds of hazardous waste (about ½ drum), 2.2 pounds of acutely hazardous wastes, or 220 pounds of contaminated soil or absorbent. Under the Hazardous Waste Coordinator (HWC) Certification program, any FQG must have on staff a certified HWC trained to ensure compliance with hazardous waste rules.

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- Publishing required public notice(s); and
- Setting up the Repository.

The RTAP demonstration was much harder and time consuming for printers to complete than was originally anticipated. The PrintSTEP team provided extensive support and it is believed that this support had a strong influence on the large number of printers choosing to participate in the pilot.

Processing standard air permits in NH includes reviewing the application forms for completeness, reviewing emission calculations for accuracy, reviewing applicable rules for insertion into the permit, preparing the permit, discussing the permit with the source, and posting the permit for public notice.

The information displayed in Table 25 (above) shows that PrintSTEP required more time than the traditional system. However, the activities reflected in the PrintSTEP estimates are broader and include multimedia issues and requirements whereas the activities cited for approval of a traditional permit are specific to air permits only. Because of the support needed to get the pilot going and bring printers up-to-speed, it is difficult to make a true comparison with traditional permitting. The PrintSTEP Coordinator attributed the time consumed with PrintSTEP to three primary factors:

- **Learning curve.** Both the state and the printers experienced a steep learning curve in processing the Applications and the ensuing Agreements and Notifications. On the Agreements, a considerable amount of time was spent on waste water treatment to include the rules that vary locally from site to site, as well as inclusion of all requirements for an air permit. Once a template was established for these rules, the Agreements became much easier (e.g. time spent was reduced by more than half compared to the beginning of the pilot).
- **Changes in personnel.** The state PrintSTEP Coordinator changed several times over the course of the pilot.
- **RTAP review**. The printers were expected to perform the RTAP evaluations by themselves because these evaluations were part of their existing state requirements, but in reality, most printers needed assistance due to the complex nature of the state regulation.

Taking these factors into consideration, it is clear that the time requirement for a PrintSTEP printer joining today would be much shorter. For example, developing the fourth Agreement (not included in this evaluation) took less than half the time of each of the previous three.

Summary Assessment of the Efficiency of PrintSTEP for State Governments

While streamlining and improving the effectiveness of state government operations were not among the primary goals of PrintSTEP, such steps are embodied in the regulatory simplification and public involvement pillars of the program. In fact, if less administrative burden is placed on a printing facility, the state agency administering the program benefits

directly. Because PrintSTEP was a pilot and had a steep learning curve, as well as required significant preparation, administrative advantages were not immediately felt. However, participants widely reported that once the program was established, they believed these factors would improve.

Another administrative aspect is the positive impact on staffing by a program such as PrintSTEP. The state point of contact is able to work efficiently to resolve problems that are sector-specific. Working this way will have economies that affect the industry sector directly, and the quality of technical and compliance assistance will improve. In general, state participants in PrintSTEP felt that being a part of PrintSTEP was a positive experience.

Impacton PublicInvolvement

Design of Public Involvement Component

One of the pillars of PrintSTEP is providing an enhanced opportunity for public input on printers' environmental requirements. A Community Handbook was developed by the national PrintSTEP team, and was customized by each pilot area. This handbook described the PrintSTEP process for public involvement and also provided background on the printing industry. The concept of enhanced public involvement was incorporated into the PrintSTEP pilot by establishing processes to ensure the following:

- The community and interested parties are notified when a printer applies for a PrintSTEP environmental approval.
- The public can review any PrintSTEP Application and provide input before the state finalizes decisions.
- Printers talk with interested people early in the PrintSTEP process to promote cooperation.

Notifying the Public. All PrintSTEP Applications were placed in a public information repository. Information repositories were located throughout each pilot area. Many were at public libraries, and both pilots created websites where Applications were posted. In Missouri, information repositories were established in six St. Louis County libraries and two local Missouri DNR offices near the volunteer printers. In New Hampshire, information repositories were established at the NHDES office and in the town offices of towns of participating printers with PrintSTEP Agreements. Applications were also available via the PrintSTEP website.

A registry was also established where interested parties could register to be notified of any new Applications or other PrintSTEP activities. As described in the following section *Community Outreach Activities*, each PrintSTEP Coordinator and individual printers made considerable effort to inform the public about the PrintSTEP process and the opportunity for the public to get involved. No one registered with the PrintSTEP Registry in either pilot area.

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In addition to filing the Application in the information repository, the program also notified the public of all PrintSTEP Agreements through one of several venues including newspaper announcements, signs at the facility, and letters to public officials. Some printers with "Notifications" also took these additional steps to notify the public even though it was not required of them.

Commenting on Applications. The PrintSTEP design also included a process to address community comments. A component of this process was the opportunity for public meetings to be held, if requested, so that the printer, regulators, and the public could discuss concerns. If a case arose in which significant issues were not resolved at the public meeting, the process included a step whereby the state would work with the community and the printer to prepare a Community Involvement Plan (CIP). This plan would outline how the state agency, the printer, and the community would address the issues discussed at the public meeting. The CIP would describe what actions must be taken for the PrintSTEP process to move forward. The CIP might also describe actions to be taken after the Agreement is finalized. A CIP template was developed by the national PrintSTEP workgroup to facilitate the process.

No comments were received on any PrintSTEP Application, therefore no public meetings were held and no CIPs were developed.

Facilitating Partnerships. Many federal and state laws have public involvement components. Public involvement requirements exist because lawmakers recognize that it is important to hear from communities on local issues. The PrintSTEP design went one step further by encouraging communities and printers to actually build a partnership to work through environmental issues together. These partnerships were intended to go beyond PrintSTEP's formal public involvement (described above), so that the public could have ongoing involvement in the PrintSTEP process.

The PrintSTEP Coordinators and several printers in each pilot area initiated numerous outreach efforts to inform the public about the pilot and invite public participation; however, no community members responded.

Community Outreach Activities

To inform the community about PrintSTEP and opportunities for involvement, stakeholders in each pilot area conducted extensive outreach activities. These activities are summarized below.

When the state agency set up its PrintSTEP pilot program, one of the first steps was to establish a stakeholder advisory group (SAG). The purpose of the SAG was to help the state make decisions on many of the details of how PrintSTEP should be implemented. The advisory group included representatives from the community, industry, and government and was assembled to ensure that the pilot implementation would better represent and meet the

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needs of all stakeholders. The specific outreach activities of these groups in each state are discussed in detail in "Implementation of the PrintSTEP Pilots."

To summarize, each pilot area conducted numerous activities to raise public awareness about the PrintSTEP pilot and the opportunity for public involvement. The PrintSTEP Coordinator conducted or organized these activities including the following:

- Development of a community handbook.
- Distribution of press releases.
- Publication of articles in newsletters.
- Creation of PrintSTEP website.
- Contact with local officials.
- Establishment of information repositories.
- Organization of workshops for printers.
- Publication of brochures.
- Placement of radio announcements.

In addition to these activities, individual printers conducted their own community outreach activities. All printers in Missouri and five printers in New Hampshire conducted some individual outreach activity (in addition to the PrintSTEP Coordinator's outreach) to let the public know about PrintSTEP. Most posted a sign at their facility, several placed an announcement in the newspaper and/or sent letters to public officials, and one printer held an open house (which no one attended).

Level of Public Involvement in the PrintSTEP Pilot

As mentioned earlier, public response to PrintSTEP was limited. Public involvement can be summarized in the following manner:

- No parties registered with the PrintSTEP Registry in either pilot area.
- No comments were submitted on any PrintSTEP Application, therefore public meetings did not need to be held, and Community Involvement Plans (CIPs) did not need to be developed.
- No community members expressed interest in PrintSTEP after numerous outreach efforts to inform the public about the pilot and invite public participation.
- Active public involvement was limited to those community representatives who volunteered to join a Stakeholder Advisory Group.

Evaluation of the Stakeholder Advisory Group (SAG) Process

To evaluate the effectiveness of the public involvement component of PrintSTEP, a survey of participating community members was originally planned as part of the PrintSTEP evaluation. However, no individual community members commented on any PrintSTEP Applications or placed their names in the PrintSTEP Registries. The PrintSTEP Coordinators solicited comments from their SAGs on the community involvement aspect of PrintSTEP. This approach was used to gather as much information as possible on why the public's interest was so limited.

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The assessment of the SAG concept is based on input from those SAG members who responded to the stakeholder survey, and from the PrintSTEP Coordinators. The SAG was a key element of the public involvement component of PrintSTEP. Note that responses from the community representatives on the SAGs were also rather limited, despite numerous efforts to solicit their input. Two people responded to the community survey in Missouri, both of whom worked for community organizations in the area. Seven people responded to the stakeholder survey in New Hampshire; all seven worked either for the state environmental agency or for EPA Region 1. Their responses are summarized below.

The diverse nature of the SAG is what made it work well. All respondents said they were satisfied or very satisfied with how the PrintSTEP SAG worked. In both states, the aspect of the stakeholder advisory process that was found effective was the cross-sectional composition of the stakeholder group. A Missouri respondent said that having "representatives from the printing industry, the regulatory agencies, and the community was an excellent idea." Another respondent felt that the group's "broad representation kept the process even and did not allow for any single opinion to dominate."

Maintaining this diverse representation can be challenging. In New Hampshire, broad stakeholder involvement was achieved early in the development of the program, but less so after that. The members representing the public tended to decrease their participation. Also in New Hampshire, more regulatory people (than community representatives overall) were involved in the stakeholder group. One respondent commented that stakeholder input is critical to developing programs and should be continued, but it is keeping stakeholders' attention that is challenging. This challenge may have been compounded in New Hampshire due to turnover in the PrintSTEP Coordinator position during the early stages of the pilot.

Maintaining communication is needed, while minimizing the burden on members' schedules. Missouri maintained the diverse representation of the SAG largely by having frequent meetings. The PrintSTEP Coordinator in New Hampshire thought more frequent meetings or communications among stakeholder advisory group members were needed, and the sporadic nature of the communications could have contributed to the lack of on-going participants from the New Hampshire stakeholder group. This thought was echoed by a SAG member who said that members should have been kept more up-to-date. Conversely, in Missouri, one criticism was that there were too many meetings to attend. To improve the efficiency of the Missouri SAG meetings, a facilitator was brought in, which SAG members agreed improved the progress of the group discussions and shortened meetings.

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Evaluation of the Printers' Involvement with the Public

In addition to the feedback from SAG members, participating printers also provided input on the public involvement component of PrintSTEP through phone interviews. Their views are presented below, along with additional information from SAG members.

The public involvement component of PrintSTEP was not viewed as providing any direct benefit for participating printers. The usefulness to printers of PrintSTEP's public involvement component was assessed based on telephone survey responses. Findings show that printers generally did not find the public involvement component of PrintSTEP to be beneficial. Specifically:

- None of the printers said they learned about community concerns through the PrintSTEP public involvement process. For example, one printer held an open house and no one attended. This printer had also posted a sign outside the facility and put an announcement in the newspaper. This printer thought his facility's involvement efforts did not provide any direct benefit.
- Four-fifths of the printers responding (83%, or 34 of 41) said that the public involvement component of PrintSTEP was not beneficial. For example, respondents said that they "didn't see any benefit" to conducting outreach activities. When asked *why* they thought the public showed such limited interest, most printers said their impacts were too small to warrant such attention. For example, one printer stated, "I don't think [the public has] much of an interest. They don't see print shops as a threat to them or the environment."
- The remaining printers (17%, 7 of 41) found the public involvement to be "somewhat useful." These printers did not receive any feedback from the community, but thought it was a good opportunity to "let the community know [that printers] are aware of environmental issues." One printer said he does "tell some customers about PrintSTEP and that people are receptive, but the general public is apathetic unless the subject directly involves them."

Other stakeholders thought public interest was so limited because of the relatively low environmental impacts of the printing industry. Stakeholders interviewed said the printing industry in general is not perceived to be a business posing adverse effects on the environment. If a member of the community were to focus attention on environmental protection that attention would most likely be focused on a bigger industry or a neighborhood business directly affecting the community member's environment. Several respondents stressed that they didn't think it was a negative outcome that community interest was so limited. The printing industry is perceived to present a low risk to the environment. Historically, the public rarely speaks up unless the facility presents unresolved problems (e.g., odor or noise complaints). In this case, it seemed to some stakeholders that members of the public didn't perceive that they needed to weigh in on the issues presented. In some cases lack of an organized, active, and involved community (or neighborhood) organization also may have contributed to the lack of community involvement.

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Few stakeholders thought changes to the PrintSTEP design would result in greater community interest. The stakeholders that did offer suggestions for improving community outreach suggested: more open houses at printers' facilities; additional local press releases; more meetings with local community leaders; and participation in community events (e.g., school graduations, town parades, sporting events). Other stakeholders did not think additional efforts or changes to the pilot design would result in any public participation. On this note, these stakeholders suggested that no further attention be focused on public interest or involvement.

Summary Assessment of PrintSTEP Public Involvement

Public involvement was one of the pillars in the design of the PrintSTEP program. In addition, public involvement was one of the key elements that made the project different from anything EPA and the stakeholders, as a group, had tried before. In the design stage, extensive planning went into incorporating and encouraging public involvement in PrintSTEP. During implementation, considerable time and effort were spent to elicit public participation. A variety of outreach activities to inform the public did not result in input from the community. However, it is not possible to know how the public responded to the outreach information. Several scenarios are possible:

- Did members of the public read press releases (or newspaper announcements, signs, or newsletter articles) and, based on what they read, feel reassured that printers were generally an environmentally responsible industry? If so, PrintSTEP's public involvement efforts were an effective and worthwhile outreach tool.
- Did members of the public ignore the PrintSTEP announcements, thinking that the environmental impacts of printing are not enough of a concern for their valuable free time? If so, the time, energy, and expense spent on informing an indifferent audience was not the best use of resources.
- Were outreach efforts insufficient to reach those members of the community who would have been interested in participating? If so, more costly or extensive efforts (e.g., TV or radio announcements) would be warranted only if evidence indicates that the public would be interested.

Without knowing which of these scenarios occurred, it is assumed that some aspects of all scenarios may have played into the final lack of public interest. Results from stakeholder interviews suggest that the second scenario is most likely (i.e. the environmental impacts of the participating printers were not of public concern). In future projects, a method should be devised to assess the level of public interest prior to designing a public involvement program and conducting extensive outreach activities. This assessment could be initiated through the one component of the public involvement design that was a clear success: the SAG, which included representatives of the community. The SAG's input into the implementation of the program was essential. However, most of the public involvement aspects of PrintSTEP were largely finalized prior to the SAG's involvement. This development work was done at the national level, and included extensive and passionate input from national advocates for public involvement. Similar to the other program components, the Community Handbook

developed by the National PrintSTEP team was intended as a guide, where each SAG would use their knowledge and expertise to determine an appropriate level of effort and identify the most appropriate and cost-effective form of public outreach for their community. It is not certain that a local SAG could have foreseen the lack of public response to PrintSTEP, but this group is the best resource to develop an effective public outreach plan for a given geographic location.

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Benefits and Drawbacks of Participating in PrintSTEP

Benefits

During the telephone survey at the end of the PrintSTEP pilot, printers were asked about benefits they saw from their involvement in PrintSTEP. The majority of printers responding (57%, or 20 of 35) said they gained a better understanding of their company's environmental impacts. Printers expressed a variety of motivations for joining PrintSTEP; however, the most frequent response was that they joined to improve their environmental compliance and better understand their requirements. PrintSTEP met this need, as most printers consider one of the primary benefits of their participation to be this understanding. The majority of PrintSTEP participants were out of compliance prior to their involvement with the pilot; PrintSTEP brought these printers into compliance. Printers made the following comments:

- "Everyone in the shop is aware of the environmental impact of what they are doing. It differentiates us from other printers."
- We have "a greater awareness of hazardous materials. We found ways to reduce consumption of materials … saving money."
- "We were able to get into compliance without worrying about punitive action from the government."
- "I don't have to wonder if we're doing the right thing [regarding environmental requirements]; I'm sure we are."

The second most frequently stated benefit was having a single point of contact for environmental questions. Printers felt having access to the PrintSTEP Coordinator improved communications and their relationship with the environmental officials:

- "Just having a real person who provides guidance and assistance as opposed to punitive threats" is the greatest benefit.
- "I feel comfortable calling the state now and know who to call."

Table 26 summarizes printers' responses to the benefits they realized from involvement in PrintSTEP.

Table 26: Benefits Printers Saw from Their Involvement in PrintSTEP

Benefit	Percentage Responding
Better understanding of the requirements/environmental impacts of their materials	57% (20/35)
Single cross-media contact for printing	29% (10/35)
Other: consolidation of requirements; community responsibility/public image	9% (3/35)
No benefits seen[11]	6% (2/35)

Source: PrintSTEP pilot endpoint telephone survey of participating printers.

[11] One printer said they were involved with "pre-press only." The other did not provide an explanation.

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The state PrintSTEP Coordinators were also asked about the benefits of PrintSTEP, based on their experience. Both Coordinators found the program to be a valuable approach to improving the environmental performance of small businesses. The Missouri Coordinator stressed the value of multimedia assessments in identifying opportunities for reduced environmental impacts. He also stated that he found plant-wide air limits to work very well and thought the PrintSTEP Air Levels should serve as a model for other programs.

The New Hampshire Coordinator stressed the benefit of bringing printers into compliance, and helping them to maintain compliance through the simplified process offered through PrintSTEP. She also noted other benefits including promoting environmental awareness, helping printers learn to review their materials and implement pollution prevention, and providing operational flexibility.

Drawbacks

During the telephone survey at the end of the pilot, printers were asked to describe what they saw as the drawbacks from their involvement in PrintSTEP. Of the 16 printers responding to this question, 62% (10 of 16) said they did not see any drawbacks. The remaining six respondents gave a variety of responses, as summarized in Table 27. The following specific comments were made:

- "Initially, it was extremely time-consuming. I had to do things that my competitors did not. In the long term, though, I think it was worth it."
- "It was an extra burden that I don't think we should even be involved in. I had to hire someone for RTAP calculations." (Note: RTAP was a NH state requirement regardless of PrintSTEP.)

Table 27: Drawbacks Printers Saw from Their Involvement in PrintSTEP

Drawback	Percentage Responding
None	63% (10/16)
Initially it required a lot of time (but not after the first year)	13% (2/16)
Time-consuming compared to the traditional system	13% (2/16)
Requires a definite commitment by the owner	6% (1/16)
Higher costs for PrintSTEP printers; everyone should do this	6% (1/16)

Source: PrintSTEP pilot endpoint telephone survey of participating printers.

The state PrintSTEP Coordinators were also asked about the drawbacks of PrintSTEP. The Missouri Coordinator found the lack of community participation to be the pilot's greatest drawback. In thinking ahead to how PrintSTEP concepts could be implemented in other areas of the state, or in other sectors, he thought there could be difficulty in applying the model. Much of the success of PrintSTEP, he said, is based on having a single point-of-contact who is knowledgeable about the sector and the sector's requirements. To duplicate the approach, he stated, would require training the proper staff to provide sector-specific, multimedia assistance.

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The NH Coordinator found the voluntary design of the pilot to be a drawback in that it did not ensure a level playing field for all NH printers. She felt that printers in the program who are now in compliance put a lot of effort into coming into compliance, as compared to the effort put in by non-participating printers which remains unknown. If PrintSTEP became mandatory, it is anticipated that it would level the playing field and bring more printers into compliance. Additionally, she noted that being a new program, the process was very time-consuming at first for both the state agency staff and the printers. The printers had to work through the RTAP information for the first time, even though it was an existing program required by NH regardless of PrintSTEP. Some of the printers thought they were in compliance going into it the program, only to find out they were not and that work was needed to come into compliance.

OverallSatisfactionwithPrintSTEP

During the telephone survey at the end of the pilot, printers were also asked how satisfied they were with PrintSTEP. Their responses are summarized in Table 28.

Table 28: Participating Printers' Satisfaction with PrintSTEP

Level of Satisfaction	Percentage Responding	
	Missouri	New Hampshire
Very Satisfied	100% (7/7)	79% (23/29)
Somewhat Satisfied	0%	21% (6/29)
Somewhat Unsatisfied	0%	0%
Unsatisfied	0%	0%

Source: Endpoint telephone survey of printers.

The PrintSTEP Coordinators were also both very satisfied with the pilot. The New Hampshire Coordinator stated that PrintSTEP had resulted in greatly increased compliance and awareness of environmental impacts for the printers involved in the program. In the long run, she commented, there will be cost savings to businesses and the state agency.

Summary of Findings

The evaluation findings are portrayed under two headings: a) The achievement of PrintSTEP goals; and b) Printers' perspectives on benefits, drawbacks and satisfaction with PrintSTEP.

AchievementofPrintSTEPGoals

The national PrintSTEP team established the goals of PrintSTEP which directed the design of the pilot program. The goals were met for the program to a greater or lesser extent and in various ways as described below.

Goal 1: Enhance Environmental Protection

With regard to enhancing environmental protection and practices, improvements were observed in some areas while in others little or no change was seen. While air emissions and hazardous waste generation increased when summed across participating facilities, the results did show that a greater number of PrintSTEP facilities decreased air emissions and hazardous waste releases as compared with non-PrintSTEP facilities during the pilot, when corrected for activity level. Across both states, 51% of PrintSTEP printers reduced air emissions during the pilot as compared with 38% in the non-PrintSTEP group. Across both states, 66% of PrintSTEP printers decreased waste during the pilot compared to 48% of non-PrintSTEP printers. With regard to waste water, there was no net change in the discharge status of PrintSTEP printers. Similarly, there was no net change in the number of PrintSTEP printers requiring a storm water permit.

In addition, other indirect measures of environmental performance were observed. The pilot led to improved compliance for 86% of the participating printers and promoted pollution prevention and overall environmental awareness. These factors greatly enhance environmental protection.

Goal 2: Increase Use of Pollution Prevention Practices

Pollution prevention activity increased by an average of 5% for PrintSTEP printers. This increased activity can be attributed to the direct, on-site technical assistance provided by the PrintSTEP Coordinators, resulting in greater awareness of potential pollution prevention actions. It was also observed that printers that discontinued a pollution prevention practice often had an accompanying elimination of the associated process or equipment at their facility (e.g., silver recovery was no longer used because the printer switched to digital pre-press applications and no longer had silver discharges). Lastly, many PrintSTEP printers were already practicing pollution prevention when they joined the pilot as would be expected from facilities interested in a voluntary program focused on environmental protection.

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Goal 3: Improve Efficiency of the Regulatory Process for Printers

One of the goals of the designers of PrintSTEP was to offer a streamlined method for printers to address their environmental requirements. This concept of improved "efficiency" encompasses many facets, including:

- A streamlined methodology for printers to learn about and understand their environmental requirements across all media.
- Flexibiity in the regulatory process to allow printers to respond to business opportunities more quickly.
- A process in which recordkeeping and reporting requirements are less time-consuming for printers.

In some of these areas, PrintSTEP offered significant improvements, while in others the pilot had little effect. A summary of each aspect of efficiency follows.

Printers clearly gained an increased understanding of their environmental requirements. This understanding was their primary motivation for joining the pilot and their improved compliance and responses to the survey questions demonstrate that their understanding did improve.

The PrintSTEP pilot demonstrated that the program can allow printers to respond to business opportunities more quickly. The concept of allowing for operational flexibility and how it was implemented in PrintSTEP appears sound. However, since few printers experienced operational changes during the course of the pilot program, when all participants were surveyed, the majority of printers saw no change in turnaround time to process their environmental permits or requirements.

Participants noted the significant value in having a designated PrintSTEP Coordinator in each pilot area. Almost all participants contacted their Coordinator at some point during the pilot and the vast majority were very satisfied with their interactions.

With regard to time requirements, some Missouri printers did see reductions, with 67% spending less time on reporting under PrintSTEP; however, most saw no improvements in time spent on recordkeeping. In New Hampshire, approximately one-half of the printers saw no change in the time spent on recordkeeping and reporting, while a fair number said their time spent was greater under PrintSTEP, and a few said their time decreased. This finding may be the result of four factors: a) many printers were not meeting their environmental recordkeeping and reporting requirements prior to PrintSTEP and as a result, did not spend any time on these activities prior to the pilot; in fact, almost all of the printers responding to questions indicated that the additional time spent on environmental requirements under the pilot was worthwhile; b) due to constraints within state organizations, there were still some media-specific reports and fees due at various times throughout the year which could not be consolidated; c) a new state requirement (the NH SQG Self-Certification program) was

introduced after the pilot was launched; and d) participants in NH had to submit updated RTAP emission calculations in 2005 for the purposes of this evaluation.

Goal 4: Improve Efficiency of the Regulatory Process for State Governments

Launching and establishing this pilot program proved to be more time-intensive for state environmental agencies than the traditional regulatory system. Because PrintSTEP was a multi-media pilot with a steep learning curve and required significant preparation, administrative advantages were not realized during the timeframe of the pilot. However, PrintSTEP Coordinators commented that after the initial setup (including establishment of MOUs, teaching state required reporting, and other requirements, the process became more streamlined and efficient. The state PrintSTEP Coordinators were able to work efficiently to resolve problems that are sector-specific.

Both state PrintSTEP Coordinators were very satisfied with the pilot. As one put it, PrintSTEP had resulted in greatly increased compliance and awareness of environmental impacts and would result in cost savings to businesses and the state agency in the long run.

Goal 5: Enhance Public Involvement

While the opportunity for public involvement was significantly enhanced through the PrintSTEP pilots, the general public did not show any interest in PrintSTEP. Certainly, the opportunity to obtain information was available to anyone interested in finding it. The findings of the pilot show that the public did not appear interested in getting involved with an environmental program for this industry sector. This lack of public interest was interpreted by several stakeholders as an indication that the public did not perceive problems with the participating printers and therefore did not become involved in the PrintSTEP pilot.

Goal 6: Provide Motivation for Stakeholders to Participate in PrintSTEP

The evaluation findings showed that most printers were motivated to join PrintSTEP in order to improve their environmental compliance and better understand their environmental requirements. PrintSTEP met this need, as printers consider one of the primary benefits of their participation to be this improved understanding. The benefits realized under PrintSTEP outweighed the drawbacks of the pilot program in that printers overall were very satisfied with the program. This would indicate that there is sufficient motivation for printers to participate. Another motivation cited for joining was to save time and effort related to environmental requirements. PrintSTEP did not provide this benefit to the majority of participants. For most participants, time requirements increased or remained the same during PrintSTEP, although possible reasons for this were described under Goal 3, above.

The potential for flexibility in making process modifications and responding quickly to business opportunities was realized in PrintSTEP where those situations arose. This flexibility was a potential motivation for both printers and state environmental agencies to participate in the pilot.

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The state environmental agencies were motivated to participate as a test of improved program administration designed to improve overall environmental protection. Upper management in both Missouri and New Hampshire's environmental agencies enthusiastically supported the program. With the potential for increasing the efficiency of the environmental requirements for the printing sector, motivation was provided for the ongoing involvement of this stakeholder group. The pilot was more time-consuming than the traditional system, but PrintSTEP Coordinators saw the potential for increased efficiency once the pilot's implementation phase was completed. The state agencies were very satisfied with the pilot overall, indicating the motivation for state agency involvement exists. Additionally, endeavors in both states are examining application of similar models to other industry sectors.

Finally, the general public stakeholders in PrintSTEP clearly did not have a strong motivation for participating. Industry and government personnel involved in PrintSTEP inferred that the participating facilities did not present the perception of significant environmental harm. As noted, the public is more motivated to participate in such a program if they perceive that significant problems exist which will impact them.

Printers' Perspectives on Benefits, Drawbacks and Satisfaction with PrintSTEP

During the telephone survey at the end of the PrintSTEP pilot, printers were asked about the benefits they saw from their involvement in PrintSTEP. The majority of printers responding (57%) said they had gained a better understanding of their company's environmental requirements and impacts. The second most frequently stated benefit was having a single point of contact for environmental questions. Printers felt that having access to the state PrintSTEP coordinator improved communications and their relationship with the environmental officials.

With regard to drawbacks, 62% of respondents said that they did not see any drawbacks. Those who experienced drawbacks cited the amount of time required as the most significant drawback. However, it should be noted that many printers were not meeting their regulatory obligations prior to PrintSTEP.

With regard to respondents' overall satisfaction with PrintSTEP, 100% of Missouri printers were very satisfied, 79% of New Hampshire printers were very satisfied and 21% were somewhat satisfied.

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Recommendations Based on the PrintSTEP Experience

RecommendationsSpecifictoPrintSTEP

The following recommendations are based on the findings in this evaluation report and are presented to those who would consider a PrintSTEP approach.

Fully consolidate printers' requirements for reporting and payment of fees

As noted, restrictions in the state environmental agencies did not allow PrintSTEP to fully consolidate all reporting requirements. For example, the schedule for reporting hazardous waste generation (and for paying the associated fees) differed from the schedule for reporting and the fee schedule for air emissions. PrintSTEP was not able to consolidate the reporting or the fees. Under a supplemental PrintSTEP cooperative agreement, the MO DNR has developed a state consolidated reporting form and is exploring possible applications within the state. Such consolidation would further facilitate a more fully-integrated multimedia program.

Implement the Materials Use Worksheets

The national PrintSTEP team developed process-specific worksheets to help printers estimate their emissions of volatile organic compounds (VOCs) and hazardous air pollutants (HAPs). These worksheets are designed to focus on the higher VOC-releasing materials at printing facilities, so printers can complete their estimates quickly, without wasting time on emissions that are insignificant. These worksheets were not consistently used in the pilot.

Offer online tools for air calculations and reporting

With improving efficiency as a PrintSTEP goal, developing online tools would be an effective next step. An electronic version of the Materials Use tables could streamline the calculations. The ability to complete and submit PrintSTEP Applications online could also improve efficiency. Under a supplemental PrintSTEP grant, the NH DES is developing an electronic version of the RTAP calculation method. Once finalized, the final tool should be made available in an electronic format.

Maintain ongoing communications with PrintSTEP Participants

More frequent communications with printers after they join the program would build on the PrintSTEP foundation established and could promote continuous improvements. Information could be added to the state PrintSTEP websites. The training workshops for printers held at the launch of PrintSTEP could be continued to provide refresher training, perhaps annually, and highlight new regulations and pollution prevention technologies.

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GeneralRecommendationsforFuturePilotPrograms

Members of the national PrintSTEP team proposed general recommendations for future pilot programs. These recommendations go beyond PrintSTEP and can be taken into account in future pilot programs sponsored by the EPA and/or the states.

Recommendation 1: When planning a multiyear pilot, define a process for maintaining regular communication.

Monthly stakeholder conference calls with the National PrintSTEP team throughout the pilot were extremely valuable for sharing information among the pilot states, keeping stakeholders informed, providing the state Coordinators with regular and easy access to expert opinions of the stakeholders, and reporting on milestones. For a pilot of this duration, ongoing communication is critical. Having a standing meeting time each month was very helpful. The meetings were sometimes brief, but the system provided an opportunity to stay in touch. Everyone in the national stakeholder group was invited to these calls during the term of the pilot, regardless of whether or not they participated.

Recommendation 2: Ensure that sufficient incentives exist to attract participants to pilot programs.

Before a pilot program is initiated, it is advisable for the program developers to vet the idea with a subset of the local target audience. It is worthwhile to discuss the incentives for participation in order to obtain feedback prior to implementing the pilot in that area or with that particular population. The PrintSTEP Coordinators felt that the more intimately familiar they were with the industry being targeted, the more tailored and effective the program can be. Further, if a state already has a more-streamlined regulatory structure in place, an industry sector is less likely to participate in a program with similar objectives. This situation arose with the third grantee, Minnesota, where there were insufficient incentives for printers to participate. Conversely, if a "pain point" exists within a state in regard to environmental regulation (e.g., a particularly complex environmental requirement), the state and targeted industry have further incentive to participate in a pilot that provides additional assistance to alleviate that pain point.

Recommendation 3: Develop partnerships with knowledgeable stakeholders to enhance outreach and implementation.

Partnerships for implementation are a key to success. The two active pilots, Missouri and New Hampshire, had national trade associations involved in outreach to the printers when the PrintSTEP pilot was first introduced in each state. In Missouri, an active State Advisory Group worked with the state, local and national trade association representatives to support PrintSTEP and encourage printers to participate. In New Hampshire, the local and national trade association actively participated in workshops throughout the state to educate printers on the program. In the case of the third pilot, the local trade association declined to participate because of workload, which was thought to have an affect on the low level of printers' interest. The credibility provided by industry-savvy stakeholders was crucial to

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enhance buy-in and trust in the program itself. Further, knowledgeable stakeholders can formulate solutions to technical problems and questions encountered during implementation. They also are often the source of ideas for regulatory innovations. Knowledgeable stakeholders do not only come from industry, but also from community groups, local government bodies, or elsewhere. These partnerships with stakeholders can exist and be productive even without the development of a formal "advisory committee."

Recommendation 4: Where feasible, meet with the target audience to explain the pilot .

In PrintSTEP, copious outreach and assistance materials (e.g. the workbooks) were developed. Missouri and New Hampshire held meetings with printers in their pilot areas in order to present the PrintSTEP concepts, identify the most important sections of the workbook, and respond to questions. These meetings proved to be successful at enticing participants.

Recommendation 5: Provide technical and compliance assistance to pilot participants as appropriate.

Provision of direct, one-on-one technical and compliance assistance was very effective in both earning the trust of participants and bringing all participants into compliance early in the pilot period. Such assistance helped to lay the groundwork for continued compliance and progress implementing pollution prevention options.

Recommendation 6: Assess the interest in a public participation component when designing the pilot.

If significant public interest surrounds the topic that the program addresses, it is important to incorporate a public participation component into the pilot program. However, it is worthwhile to clearly assess the level of public concern before developing a public outreach component. Feedback may be elicited from relevant local community groups in various ways, formally (e.g., surveys, interviews) or informally (e.g., discussions, meetings). Sometimes public concern may be perceived on the national level that does not clearly exist on the state or local level, where the pilot is to be implemented. If, in fact, public interest and concern are apparent, the state or local group implementing the pilot program needs to determine the best way to address it and the level of effort required.

If a pilot includes a public participation component, keep community outreach materials succinct. Feedback from the SAGs was that the PrintSTEP *Community Workbook* was too lengthy. The Missouri DNR addressed this concern by summarizing the key concepts from the community workbook in a short brochure.

Recommendation 7: Take advantage of the opportunity to apply effective elements of pilot programs elsewhere.

Incorporation of the entire PrintSTEP program may not be feasible for some local and state environmental agencies. Also, the numbers of facilities that need a different type of

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regulatory approach may be too low to warrant such an undertaking. However, distinct elements of the program may be an ideal fit within certain states or localities.

One element of the program was the workbook. Development of a regulatory roadmap that puts regulatory language into industry specific terms can be readily accomplished using the PrintSTEP workbook as one example. The state of Florida has provided such a workbook to the printing industry and the State of Wisconsin is currently in the process of developing a printing specific regulatory workbook.

Use of the Materials Use Tables for air permitting issues is another relatively easy-to-implement component of PrintSTEP. Upon revision of their permit requirements for the printing industry, the Ohio Department of Environmental Protection incorporated the Materials Use tables into their rulemaking. The Florida Department of Environmental Protection is also using the Materials Use tables for the development of their proposed regulatory changes impacting the printing industry.

Other elements include the methodology developed for community outreach and the use of a diverse stakeholder group to develop the program. Using consensus to build a program can result in a stronger and more effective program.

Recommendation 8: Where feasible, implement new opportunities for improvement even after initiation of the pilot.

States identified additional ideas for streamlining the regulatory process through their involvement in PrintSTEP. For example, NH DES is designing a computer-based model that will ease the difficulty of RTAP analyses. NH intends to continue the PrintSTEP program beyond the timeframe for the national pilot. In addition, in New Hampshire the annual report for "notification status" printers that have not made changes merely consists of signing a response card certifying compliance. In Missouri, the DNR drafted a comprehensive multi-media reporting form and will explore options for application within the state.

Recommendation 9: Develop and communicate an evaluation strategy prior to implementation of the pilot.

Prior to implementing a pilot, organizers should prepare a detailed evaluation strategy and circulate it for review. This document should explain the approach and rationale for the evaluation, including the methods to be used for information collection and the audiences to be addressed. All roles and responsibilities should be clarified in this document. The evaluation strategy developed for PrintSTEP was essential in the design of the program, from the development of the PrintSTEP Application to the selection of questions for the telephone survey. Although the evaluation deviated from the plan (i.e. a control group was determined to be too difficult to enlist), it formed the foundation and rationale for all related decisions.

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It is important to reinforce to all pilot participants that they are responsible for both implementing the program and providing input for the evaluation. This expectation needs to be clearly stated as participants are recruited and subsequently join. Failure to make this expectation explicit can create tension later when pilot participants are asked to supply data and information. The commitment to the pilot must extend to the evaluation as well.

Recommendation 10: Choose an evaluation approach commensurate with the level of participation in the pilot.

The level of effort expended on the evaluation should be proportional to the participation and extent of the pilot. A small pilot may be evaluated with a streamlined effort. Certain activities, such as conducting phone surveys with the private sector, are labor intensive and time consuming. Limiting interviews to state personnel and a small number of other stakeholders may reduce the resource requirements.

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Appendices

Appendix A – Minnesota PrintSTEP Pilot Summary
Appendix B – Sample Survey Instrument: End-point Survey for Printers
Appendix C – Sample PrintSTEP Application Form

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Appendix A:
Minnesota PrintSTEP Pilot Summary

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Introduction

A PrintSTEP pilot project was also planned in St. Cloud, Minnesota, but was concluded due to lack of interest from printers. While Minnesota baseline information does not exist, a summary of the Minnesota pilot is presented here. Information summarized from interviews with state staff is included in this section.

History

As in Missouri and New Hampshire, Minnesota received an EPA cooperative agreement to implement a PrintSTEP pilot program. The Minnesota Pollution Control Agency (MPCA) hired a PrintSTEP coordinator to run the program. PrintSTEP materials (i.e., *Printers' Plain Language Workbook* and *Community Handbook*) were customized to reflect state-specific requirements and were mailed to all printers identified in the pilot area of St. Cloud prior to hosting any information sessions. Through research conducted by the PrintSTEP coordinator, 32 eligible printers were identified in the St. Cloud area. The program was publicized to these printers in several ways:

- were invited to attend information sessions (three were held);
- printers received letters from MPCA, a joint letter of support from the printing trade groups, and a letter from a Twin Cities printer encouraging participation; and
- printers were individually contacted by phone to see if they had questions on the program, and were offered site visits to assist with their Application.

Months after the application deadline, the Minnesota PrintSTEP pilot had not received any Applications.

Based on individual phone conversations with the printers, the PrintSTEP coordinator had found two or three printers who were potentially interested, but had not completed their Applications. No other printers were interested in joining the program. The low level of interest was cause for concern; running a pilot program that had to be coordinated across media offices for only a few printers was not likely to be cost-effective. Following extensive discussions with EPA and management at MPCA, the Minnesota PrintSTEP pilot was terminated.

Factors Contributing to the Lack of Participation

According to MPCA staff, the Minnesota PrintSTEP Coordinator, EPA and several printers interviewed by MPCA, the following factors contributed to the lack of participation in PrintSTEP:

- *Regulatory simplifications were already in place in Minnesota.* PrintSTEP combines multi-media environmental requirements into one system, administered by one agency to simplify permitting. In Minnesota, regulations were already largely simplified. An innovative program had been implemented where most printers get a non-expiring Air Registration permit that has a one-page Application. Other printers do not have operations that require an air permit. For hazardous waste, MPCA had simplified reporting by supplying printouts of the facility's previous annual report and allowing facilities to simply mark revised quantities and return the form. In addition, hazardous waste fees and the Department of Revenue's hazardous waste taxes were already combined. Regarding water permitting, most printers do not have stormwater or wastewater permits due to the nature of their operations. Given the extent of regulatory reform that had already occurred in the state, most printers perceived that they would not benefit significantly from the regulatory simplification offered by PrintSTEP.

- *Smaller printers did not want to provide release and emissions data.* The PrintSTEP Application asked for release and emission information, much of which printers never had to submit to MPCA before. Being a voluntary program, small printers chose not to participate given the effort required to complete the Application as compared to the perceived benefits.

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- *MPCA's extensive Workbook was distributed prior to meeting with printers.* Minnesota had mailed their Workbooks out to each eligible printer in the area prior to the PrintSTEP information sessions. Based on his conversations with printers, the PrintSTEP coordinator also noted that printers found the PrintSTEP Workbook to be overwhelming. In order to be a comprehensive manual for all environmental concerns for every size of printer, the Minnesota PrintSTEP Workbook ended up being over 100 pages long. Many printers did not feel they had the time to invest in reviewing the Workbook.

- *The community in St. Cloud did not show interest.* After extensive outreach to encourage public involvement, no members of the community expressed interest in participating in the program. During meetings in the winter of 2000-2001, members of the Minnesota PrintSTEP Stakeholders Advisory Group expressed that the printing industry in St. Cloud is not enough of a concern for the public to be involved. If the public had reason to be concerned and there had been greater community involvement, printers may have been more interested in joining as a way to interact with concerned members of the public and to improve their image.

- *Free pollution prevention assistance was already available in MN.* PrintSTEP encouraged pollution prevention primarily by offering free technical assistance and by highlighting how reduced releases and wastes lead to reduced regulatory requirements. Free technical assistance was already available to Minnesota printers through two sources: Minnesota Technical Assistance Program (MnTAP) and MPCA's Small Business Assistance Program.

Options Considered to Increase Participation

- Before concluding the PrintSTEP pilot, MPCA investigated several options for increasing participation.
- *Emphasize the expected increase in compliance.* PrintSTEP has a strong compliance assistance component. The pilot program considered stressing how PrintSTEP participation would improve their compliance across regulations. This approach has been successful in New Hampshire's PrintSTEP pilot. However, Minnesota was phasing out inspections of smaller media sources and Very Small Quantity Generators making it difficult to back up such an incentive.

- *Expand the PrintSTEP pilot area.* Intensive effort went into marketing the 32 eligible printers in the St. Cloud pilot area. This effort did not result in any printer Applications to join the program. Expansion of the pilot area may have produced enough applicants to run a meaningful pilot, however, extensive resources would be required to market to multiple areas, or statewide. Given the level of effort expended in St. Cloud with no applicants responding, it seemed likely to the PrintSTEP coordinator that similar efforts in additional areas would result in few, if any applicants.

- *Reduce annual fees.* A reduction in fees was investigated to attract participants, however this was not considered a sustainable incentive. Additionally, a fee reduction alone might not be enough of an incentive for printers who are largely satisfied with the existing regulatory structure.

- *Provide other incentives.* Other incentives to increase participation were also investigated. For example, free membership to the Minnesota Waste Wise program was considered. This program usually requires a $200 membership fee. Minnesota Waste Wise is a one-stop shop for waste reduction information and assistance. Eight printers in the pilot area were interviewed to determine if such an incentive, combined with the existing PrintSTEP benefits, would make PrintSTEP more attractive. The Waste Wise incentive did not appear to be enough to change printers' decisions about whether or not to participate in PrintSTEP. Other incentives were considered, however, any

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significant additional incentives could skew the intent of PrintSTEP in that printers may be joining for add-on incentives only, rather than the benefits inherent to the program.

Appendix B: Sample Survey Instrument

End-point Survey for Printers

Telephone Survey for Printers: End-of-pilot Survey

1. In the past year, did you contact the PrintSTEP coordinator? [Bill Hernlund in Missouri or Tara Olson in New Hampshire]

   YES
   NO - SKIP TO Q1c

   a. How satisfied were you with the information obtained from *(name of state contact person and office/office)*Were you….

      Very satisfied - SKIP TO Q2
      Somewhat satisfied - SKIP TO Q2
      Somewhat unsatisfied, or
      Very unsatisfied

   b. Why weren't you satisfied with this information?

      Passed me to someone else
      Weren't knowledgeable
      Didn't have time to help me
      Other

   SKIP TO Q2

   c. Why not?

      DIDN'T KNOW WHO TO CALL
      COULDN'T REACH THEM
      DIDN'T NEED HELP
      OTHER

2. In the past year, have you obtained information from your technical assistance provider:
   For NH, this would be anyone in the Small Business Development Center, such as Andrea O'Brien, Mark Melessa, Rudy Cartier.
   For MO, this would be anyone in the Urban Outreach Office, such as Nancy Morgan or LaRhonda Garrett.

   YES
   NO - SKIP TO Q2c

   a. How satisfied were you with the assistance obtained from *(technical assistance provider/center name)?* Were you..

      Very satisfied - SKIP TO Q3
      Somewhat satisfied - SKIP TO Q3

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Somewhat unsatisfied, or
Very unsatisfied

b. Why weren't you satisfied with the assistance from (*Technical assistance provider/name*)?
Passed me to someone else
Weren't knowledgeable
Didn't have time to help me
Other
SKIP TO Q3

c. Why not?

DIFFICULT TO ACCESS
NOT ENOUGH USEFUL INFORMATION THERE
DIDN'T KNOW ABOUT IT
DIDN'T HAVE TIME/TOO BUSY
OTHER (SPECIFY)

3. In the past year, have you used the PrintSTEP Workbook or other PrintSTEP documents?

YES
NO - SKIP TO Q3d

a. Which documents?
PrintSTEP WORKBOOK
COMMUNITY HANDBOOK
FACTSHEET

b. How satisfied were you with the content and format? Would you say you were….
Very satisfied - SKIP TO Q4
Somewhat satisfied - SKIP TO Q4
Somewhat unsatisfied, or
Very unsatisfied

c. Why weren't you satisfied with the PrintSTEP documents?

Difficult to follow/understand
WEREN'T WRITTEN IN YOUR PRIMARY LANGUAGE
OTHER (SPECIFY)
SKIP TO Q4

d. Why not?

DIDN'T KNOW THERE WERE ANY

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DIDN'T HAVE THE INFORMATION I NEEDED
COULDN'T GET A COPY
OTHER (specify)

4. Did you use the PrintSTEP Information Repository during any part of the regulatory process?

YES
NO - SKIP TO Q4d

a. Which Repository location did you use?
INTERNET
LIBRARY
STATE/CITY OFFICE

b. How satisfied were you with the information available in the Information Repository? Were you…

Very satisfied - SKIP TO Q5
Somewhat satisfied - SKIP TO Q5
Somewhat unsatisfied, or
Very unsatisfied

c. Why weren't you satisfied with the information available in the Information Repository ?

DIFFICULT TO ACCESS
TOO FAR TO TRAVEL
DIFFICULT TO FIND WHAT I NEEDED
OTHER (SPECIFY)
SKIP TO Q5

d. Why not?

DIDN'T NEED IT
OBTAINED INFORMATION ELSEWHERE
DIDN'T KNOW ABOUT IT
DIDN'T HAVE TIME/TOO BUSY
OTHER (specify)

5. In the past year, have you obtained environmental regulatory information from any other source?
YES
NO - SKIP TO Q6

a. What other source was this?

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b. How satisfied were you with the information obtained from *(name of other source)?* Would you say you were….

Very satisfied - SKIP TO Q6
Somewhat satisfied - SKIP TO Q6
Somewhat unsatisfied, or
Very unsatisfied

c. Why weren't you satisfied with the information obtained from (*name of other source*)

NOT ENOUGH USEFUL INFORMATION THERE
STAFF NOT KNOWLEDGEABLE ABOUT MY QUESTION
OTHER (SPECIFY)

6. In the past year, have you been involved in any type of outreach or public involvement activity related to your environmental activities?
YES
NO - SKIP TO Q7

a. What type of community outreach were you involved with related to your facility's environmental activities?

Direct mailing
To whom?
Newspaper notice
Posting signs
Hosting or attending an open house
Hosting or attending a public meeting
Hearings of conservation commission or health board
City council meetings
Some other type of community outreach

b. In general, how useful do you think these community outreach efforts were?

Very useful
Somewhat useful
Not very useful, or
Not useful at all

If the facility did NOT have a PUBLIC MEETING, per Q6, SKIP to Q10

7. Before you held your public meeting, did you provide public notice of the meeting?

YES
NO - SKIP TO 8

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a. In providing public notice, did you use:

Direct mailing
Telephone contact
Newspaper notice or advertisement
Posted signs
Internet notice
In person or word-of-mouth
Any other type of notice (SPECIFY)

8. How useful was the (first/follow-up) public meeting as a way to learn about community concerns and expectations? Would you say it was…

Very useful
Somewhat useful
Not very useful, or
Not useful at all

9. What would have made the (first/follow-up) public meeting more useful? (MULTIPLE RESPONSES)

GREATER COMMUNITY ATTENDANCE
PARTICIPATION OF STATE AGENCY STAFF
COMMUNITY INVOLVEMENT PLAN DEVELOPED
OTHER (SPECIFY)

10. The PrintSTEP program is designed to provide opportunities for people to get involved by inviting comments on printer's application and making program information readily available to the public. For the PrintSTEP Program as a whole, there was limited interest from the public. Why do you think community members did not participate in the PrintSTEP process?

11. I'm going to read of list of possible outcomes of the PrintSTEP public involvement activities. For each one, please tell me if it was an outcome of your own involvement in PrintSTEP since you joined the program. (YES or NO)

- Your facility's compliance has improved
- You are more comfortable contacting the state agency for help
- Your facility has used new or different approaches to address environmental problems
- The schedule for your PrintSTEP Agreement or Notification was shortened compared to the time it used to take under the standard permitting process
- The schedule for your PrintSTEP Agreement or Notification was lengthened compared to the time it used to take under the standard permitting process
- Your facility now reviews the chemical content of purchased materials more closely
- Other?

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12. What effect did the multi-media (i.e., air + water + waste) coordination at the state agency have on the regulatory process? Did it usually....

Speed up the process
Slow down the process
Sometimes speed it up and other times slow it down
Have no effect at all

13. We would like to get a sense of printers' perception of your environmental regulatory requirements. For each area that I read, please tell me whether you would rate your own understanding as very good, good, fair or poor. How would you rate your understanding of the (READ ITEM)? [Repeat for pre-PrintSTEP understanding.]

	VERY GOOD	GOOD	FAIR	POOR
Air regulatory program and associated requirements	4	3	2	1
Storm Water regulatory program and associated requirements	4	3	2	1
Waste Water regulatory program and associated requirements	4	3	2	1
Hazardous Waste regulatory program and associated requirements	4	3	2	1

14. FOR EACH ITEM RESPONDENT ANSWERED FAIR OR POOR IN Q13 ABOVE, ASK:

- What about the (air/storm water/waste water/ hazardous waste) regulatory program or requirements do you find difficult to understand?

TOO COMPLICATED
LACK OF EASY-TO-READINFORMATION
NO TIME TO LEARN
HARD TO GET INFORMATION FROM GOVERNMENT STAFF
OTHER (SPECIFY)

15. Has an environmental requirement affected your company's ability to respond to a business opportunity during the course of PrintSTEP? For example, installing a new piece of equipment; meeting the request of a customer or potential customer for a different ink, coating, etc.; increasing production; or bringing out-sourced operations in-house?

YES
NO - SKIP TO Q16
Don't know

a. Can you describe a recent time this happened?

b. How big an impact did this have on your company's profitability or growth opportunity? Would you say it was…

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i. A slight impact
ii. A moderate impact
iii. A serious impact or
iv. A severe impact

16. Since joining PrintSTEP, has the time your facility spends on **record keeping** related to environmental requirements, filings, permits, and process/facility modifications, increased, decreased, or remained the same?
INCREASED
DECREASED
REMAINED THE SAME - SKIP to Q17

a. By how much (as a percentage)?
b. What caused this change?

17. Since joining PrintSTEP, has the time your facility spends on **reporting** related to environmental requirements, filings, permits, and process/facility modifications, increased, decreased, or remained the same?
INCREASED
DECREASED
REMAINED THE SAME - SKIP TO Q18

a. By how much (as a percentage)?
b. What caused this change?

18. What benefits do you see from your involvement in PrintSTEP?

19. What drawbacks do you see from your involvement in PrintSTEP?

20. What recommendations do you have for program improvements?

21. Overall, how satisfied are you with the PrintSTEP process?
Very satisfied
Somewhat satisfied
Somewhat unsatisfied, or
Very unsatisfied.

CLOSING: Those are all my questions. Thank you very much for your time.

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Appendix C: Sample PrintSTEP Application

PrintSTEP Application

1. Background Information

Reporting year:		
This is a (***circle one***): Initial PrintSTEP Application	or	Annual PrintSTEP Renewal
Your Name:	Phone:	
Facility Name:	Fax:	
Street Address:	E-mail:	
City:		
Number of Employees:	Full Time=	Part time=

2. Type of Printing Operations

TYPE OF PRINTING PROCESSES YOU USE	Check all that apply	If you have multiple processes, estimate the percentage of production from each process*:
Sheetfed Lithography		
Non-heatset Web Lithography		
Heatset Web Lithography		
Flexography		
Screenprinting		
Gravure		
Digital Impressions		

3. Waste Water Information

Refer to Chapter 3 in *Plain Language Workbook*.	Yes	No
Do you discharge any wastewater to a septic system? If so, what do you discharge? _____ _____		
Do you discharge industrial wastewater to a sewer district? If yes, what do you discharge? _____ _____ Do you have an authorization letter or permit from your POTW?		
Do you discharge wastewater directly to surface water? If so, what do you discharge? _____ _____ Do you have an NPDES permit for this discharge?		

If you have a wastewater permit or authorization letter, complete the following information:

	Date Permit Obtained		Permitting Authority:	
	Expiration Date:		Permit Number:	

Estimate the amount of waste water discharged over the last 12 mos.

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4. Storm Water Information

Refer to Chapter 4 in the *Workbook*.

	Yes	No
Do your facility meet the "no-exposure" status for wastewater as determined by the checklist on Page X of Chapter 4 in the Workbook?		
Please attach a copy of your checklist.		

5. Hazardous Waste Generation

Refer to Chapter 5 in the *Workbook*.

Do you have an EPA ID Number for hazardous waste generation? **If so, what is it?** _____	
What is your RCRA generator status?	**Check One:**
No hazardous waste generated	
Status is Unknown	
Small Quantity Generator (SQG)	
Full Quantity Generator (FQG) <1000kg/month, or 2200#/month	
Full Quantity Generator (FQG) >1000kg/month, or 2200#/month	
If you are a SQG, have you submitted your self-certification declaration, fee and Corrective Action Plan, if necessary, by applicable deadline (1/04, 1/05, 1/06)?	**Y or N**
If you are a FQG, have you or a staff person at your facility completed the required annual coordinator training and certification and renewed it annually?	**Y or N**

List all industrial wastes generated during the past 12 months; attach additional sheets if necessary.

Name of the Waste	**Waste Type***	**Process or Activity Generating Waste**	**Amount Generated** (lbs or gal)

- If the waste is a listed hazardous waste, enter the RCRA waste code (such as D001), otherwise enter the RCRA characteristic ▯ ignitable, corrosive, reactive, or toxic.

6. Air Emissions

Refer to Chapter 6,7, and 8 in the *Workbook*.

What is your VOC Air Level, calculated from Chapter 6?						
	circle one:	1	2	3	4	5
Are you below deminimus levels for each RTAP you use? (see Chapter 7 in the workbook). Yes or No?						
	If YES: proceed to next section.	or	If NO: contact NH DES Air Resources Division.			

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7. Public Involvement

Refer to Chapter 11 in the *Workbook*.

How has your facility interacted with your community and immediate neighbors in the past year regarding environmental concerns? (Refer to Chapter 11 in the *Workbook*)	**Check all that apply**
Open House	
Mailings – advertising	
Mailings - non-advertising	
Discussions with Community leaders	
Public Meeting	
No Activity	

8. Technical Assistance

Refer to Appendix A in the *Workbook*.

As a PrintSTEP participant, you will have access to free technical assistance. These specialists can help you with pollution prevention, environmental compliance, or any questions on PrintSTEP. A list of technical assistance contacts is provided in Appendix A. Check here if you would like a technical assistance specialist to contact you: " Please list any areas you particularly would like assistance with.

_____

_____

_____

_____

9. Production or Activity Indicator

You will report a single number <u>without units</u>. Only you will know the derivation of this number (be it square feet printed, sales, labor hours, etc.). You will keep that information on file for use again in the next reporting cycle, when the next year's number will be compared to the last year's number to see how it has changed.

Please turn to page X for an explanation and directions.
What is your production or activity indicator?_____

Directions for Completing Question #9: Productivity Indicator.

EPA is collecting environmental impact data on this application in order to evaluate the overall pilot PrintSTEP program, which is being carried out in three states. In order to accurately account for changes in environmental emissions or waste during the course of the PrintSTEP program, EPA must be able to determine if a change in emissions/waste is the result of a change in environmental management practices, or if the change is due to increasing or decreasing production. To make this determination possible, facilities must provide: 1) an indicator of current year production; OR 2) an indicator for level of activity based on a variable other than production that is the primary influence on the quantity of material your facility recycles, treats or releases. You may report a number reflecting either production or activity.

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While several methods are available for determining this data element, *the production or activity indicator must be based on the variable that most directly affects the quantities of material recycled, treated or released.* Examples of indicators available include the following:

Square feet of substrate printed this year;
Number of impressions made this year;
Total annual sales this year;
Total annual labor hours this year;
A different method that you select.

Example 1, using sales:
You determine that annual sales is the best indicator of the quantity of material your facility recycles, treats or releases. Your total annual sales were $500,000 in 2000. You could report an activity indicator of 5.0; 500,000; or something similar that reflects sales but does not include units.

Example 2, using number of impressions:
The variable that most closely reflects the quantity of material the facility recycles, treats or releases is number of impressions, since most of those impressions are similar in terms of size, substrate, and complexity. If your total number of impressions was 104,000 in the current reporting year, you could report a production indicator of 104.

10. Pollution Prevention Information

Refer to Chapter 2 and Appendix B in the *Workbook*.

Pollution Prevention Practice For new PrintSTEP applicants, answer: Have you ever...? For annual renewal of PrintSTEP, answer: Over the last year, have you?	*Check the appropriate column:*				
	Yes	**No**	**Investigating**	**Don't Know**	**N/A**
PREPRESS Eliminated chrome based cleaners?					
Installed and properly maintained silver recovery units?					
Used developer and fixer recycling units for film processors?					
Used low replenishing rate film chemistry?					
Used recycling units for film and plate processor washwater?					
Used digital, dry, or water-based proofing systems?					
PRINTING Used first-in-first-out inventory system to reduce waste ink disposal costs?					
Switched to low VOC ink systems (e.g., UV curable, water or vegetable-based technology)					
Used stay open inks or cartridge ink delivery system?					
Where possible, used low solvent, or water-based ink jet inks?					
Used chiller re-circulators to reduce evaporation and lower air emissions?					
Switched to isopropyl alcohol free fountain solutions or reduced concentration of isopropyl alcohol in fountain solution?					

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Pollution Prevention Practice For new PrintSTEP applicants, answer: Have you ever...? For annual renewal of PrintSTEP, answer: Over the last year, have you?	*Check the appropriate column:*				
	Yes	**No**	**Investigating**	**Don't Know**	**N/A**
Installed filtration system for fountain solution re-circulation system?					
POST-PRESS/ CLEANING/WIPES Switched to low vapor pressure or low VOC cleaning solvents (less than 10 mm Hg) to reduce air emissions and solvent use?					
Replaced hazardous solvents with non-hazardous or less hazardous solvents?					
Instituted a solvent recycling/reuse system?					
Stored soiled wipes in closed or covered containers to reduce air emissions?					
Recover free liquids from shop towels (i.e., gravity draining, wringers, centrifuges, etc.)?					
Where possible, used low solvent, no solvent-based, or water-based adhesives and glues?					
REUSE/ RECYCLING Implemented a solid waste/recycling program to recycle all possible items from your solid waste stream?					
Reused and recycled pallets and skids to reduce solid waste?					
Collected and recycled used oil, other lubricants, and batteries?					
Recycled parts washing fluids?					
Properly Recycled or disposed of spent fluorescent and HID lamps?					
Requested vendor take back all samples not consumed?					
HOUSEKEEPING Covered all open containers of liquids and keep them closed?					
Stored all materials to minimize damage due to mishandling or accidents?					

Confidential Business Information (CBI) Notice:

EPA's regulations on confidential business information (CBI) are found in 40 CFR Part 2, Subpart B. (A copy is available, upon request, from your State PrintSTEP coordinator.) Please identify any information that you claim is confidential business information. If you make a confidentiality claim, and if EPA determines that the information you designated meets the CBI criteria in 40 CFR Section 2.208, we will disclose the information only to the extent, and by means of the procedures, specified in 40 CFR Part 2, Subpart B. If no such claim accompanies the information when it is received by EPA, it may be made available to the public without further notice to the business.

Signature of PrintSTEP Applicant: _____

Printed Name: _____

ED_001523_00007071-00090

To: Dravis, Samantha[dravis.samantha@epa.gov]
Cc: Elizabeth Rosenberg[erosenberg@cnas.org]
From: Kaleigh Thomas
Sent: Wed 9/13/2017 12:56:42 PM
Subject: Re: Thu
9.14 Future of U.S. Climate Leadership Event Participants List.pdf
CNASReport-AfterParis.pdf

Ms. Dravis,

I have attached the attendee list as well as the report we are releasing in coordination with this event and copied the event invite below. The roundtable is tomorrow from 9:30am to 11:00am at the Center for a New American Security (1152 15th Street NW, Suite 950, Washington DC 20005). Please arrive no later than 9:15am so we can review any last minute details.

Please let me know if I can be of further assistance or address any additional questions.

Best,

Kaleigh

Kaleigh Thomas
Program Coordinator
Energy, Economics, and Security | Middle East Security
Center for a New American Security
kthomas@cnas.org
D 202.457.9406
M 804.543.8778

A CNAS EVENT INVITATION

The Future of U.S. Climate Leadership

Thursday, September 14, 9:30 am to 11:00 am

A private roundtable with remarks by:

George David Banks
Special Assistant to the President
for International Energy and the Environment
National Security Council

Elgie Holstein
Senior Director for Strategic Planning
Environmental Defense Fund

Presented by:

Elizabeth Rosenberg, CNAS Program Director and Senior Fellow, will host.
David Gordon, CNAS Adjunct Senior Fellow, will moderate.
Divya Reddy, Eurasia Group Practice Head, will serve as a discussant.

Please join us for a private, off-the-record roundtable to discuss the future of U.S. climate leadership. The dust is now settling on President Donald Trump's controversial decision to withdraw the United States from the 2015 Paris Agreement on climate change. We must now focus on climate policy issues facing the United States – both international and domestic – in the aftermath of leaving the Paris Agreement. At this time, the starting point for effective policy should be to do what is principled yet practical. The discussion will focus on the following questions: (1) How should the U.S. administration craft a climate agenda that serves U.S. interests? (2) Is the strategic implication of the U.S. withdrawal from the Paris agreement in order to focus on clean energy a concept around which U.S. stakeholders can rally? (3) Can the United States remain a global leader on climate policy?

The event will coincide with the launch of a CNAS report on "**After-Paris: A Climate Agenda that Serves U.S. Interests"** by David F. Gordon, Divya P. Reddy, and Elizabeth Rosenberg.

Please note that this is a private, off-the-record event and invites are non-transferrable. **To RSVP to this event, please contact Kaleigh Thomas at kthomas@cnas.org.**

Center for a New American Security
1152 15th Street NW | Suite 950
Washington, DC 20005

Thursday, September 14, 2017
9:30 am - 11:00 am

George David Banks serves as Special Assistant to the President for International Energy and Environment. Banks was previously Executive Vice President of the American Council for Capital Formation, a business association based in Washington, D.C. Banks also served as GOP Deputy Staff Director of the Senate Environment and Public Works Committee and Senior Adviser on International Climate at the Council on Environmental Quality under President George W. Bush. He also worked as a diplomat for the U.S. State Department and analyst for the Central Intelligence Agency. Banks holds a B.A. in economics, history, and political science and an M.A. in economics from the University of Missouri, as well as a J.D. from George Mason University.

Elgie Holstein serves as the Senior Director for Strategic Planning at the Environmental Defense Fund. In this role, he coordinates strategy and policy work and represents EDF's programs to policymakers, supporters, and the media. Holstein brings extensive career experience — having held a number of senior positions in government and the private sector — with a focus on energy,

natural resources, and environmental policy. Holstein's government service has included senior positions in which he has been responsible for a variety of natural resources, environmental, science, energy, and economic policy issues. Those positions include Associate Director of Office of Management and Budget for Natural Resources, Energy and Science; Special Assistant to the President for Economic Policy, White House National Economic Council; Assistant Secretary of the National Oceanic and Atmospheric Administration; and Chief of Staff, U.S. Department of Energy.

The Center for a New American Security (CNAS) is an independent and nonpartisan research institution that develops strong, pragmatic and principled national security and defense policies. CNAS leads efforts to help inform and prepare the national security leaders of today and tomorrow.

From: Elizabeth Rosenberg
Sent: Wednesday, September 13, 2017 8:42:35 AM
To: Dravis, Samantha
Cc: Kaleigh Thomas
Subject: Re: Thu

Of course. Kaleigh, please send Ms. Dravis the RSVP list, the invite, and the logistical information.
Thank you!

Sent from my iPhone

On Sep 13, 2017, at 8:39 AM, Dravis, Samantha <dravis.samantha@epa.gov> wrote:

> Can you share an attendee list with me?
>
> Sent from my iPhone
>
> On Sep 13, 2017, at 8:37 AM, Elizabeth Rosenberg <erosenberg@cnas.org> wrote:
>
>> Dear Ms Dravis,
>> That sounds good--an EPA perspective would be very welcome. I can speak now until 10, or after about 12:30. Please call my cell at 646-241-1038.
>> Thank you, Liz
>>
>> Sent from my iPhone
>>
>> On Sep 13, 2017, at 7:11 AM, Kime, Robin <Kime.Robin@epa.gov> wrote:
>>
>>> Will do

Sent from my iPhone

On Sep 13, 2017, at 7:06 AM, Dravis, Samantha <dravis.samantha@epa.gov> wrote:

> We need to discuss before I accept the invitation.
>
> I can speak on behalf of Administrator Pruitt, but not the Administration as a whole and not on behalf of the President.
>
> Robin can you set up a time for us to talk?
>
> Sent from my iPhone
>
> On Sep 12, 2017, at 9:53 PM, Elizabeth Rosenberg <erosenberg@cnas.org> wrote:
>
>> Dear Ms. Dravis,
>>
>> Thank you for your willingness to participate in our event this Thursday morning. I'm looping in my colleague Kaleigh who can send you the event invitation and details on the logistics. She can also send you the report that we'll be releasing on Thursday on the same general topic as our event.
>>
>> As for the program Thursday, I will open the intimate, off the record conversation and turn to our moderator, David Gordon for speaker introductions. Then, we would like to invite you to offer brief remarks (5-8 minutes) to discuss the U.S. administration's agenda for international climate and environmental leadership following the President's indication that the U.S. will depart the Paris framework on climate change. We will then turn to Elgie Holstein from EDF to contribute some ideas about opportunities for U.S. climate leadership outside or alongside the Paris framework. We will then open the conversation to the group, which will be comprised of an array of stakeholders from the energy industry, environmental community, and policy analytical/policymaker community.
>>
>> Let me know if you have any questions and we look forward to hosting you Thursday.

All the best, Liz

From: Banks, George D. EOP/WHO <George.D.Banks@who.eop.gov>
Sent: Tuesday, September 12, 2017 8:14 PM
To: Elizabeth Rosenberg
Cc: Dravis, Samantha
Subject: RE: Thu

Yep, connecting you now. Many thanks - d

-----Original Message-----
From: Elizabeth Rosenberg [mailto:erosenberg@cnas.org]
Sent: Tuesday, September 12, 2017 8:02 PM
To: Banks, George D. EOP/WHO <George.D.Banks@who.eop.gov>
Subject: Re: Thu

Thanks for your email and I'm very sorry to hear that you can't make it. We'd be very glad to host Ms. Dravis. Can you put us in touch?
Many thanks and look forward to working with you again soon, Liz

Sent from my iPhone

> On Sep 12, 2017, at 7:55 PM, Banks, George D. EOP/WHO <George.D.Banks@who.eop.gov> wrote:
>
> Hey Liz,
>
> Bad news on my front.
>
> My apologies, but I now have a West Wing scheduling conflict that prevents me from participating on Thu.
>
> Samantha Dravis from EPA is willing to fill in if that works for you.
>
> Again, apologies for any inconvenience.
>
> Please keep me in mind for future events - d
>
>
>

The Future of U.S. Climate Leadership

September 14, 2017

Aaron Allen
Senior Legislative Assistant
Congressman Juan Vargas

Neil Bhatiya
Research Associate, Energy,
Economics, & Security Program
Center for a New American Security

Kevin Book
Managing Director
ClearView Energy Partners, LLC

Victor Ceravino
Senior Manager, Government Relations
MHPS America, Inc.

Andrea Clabough
Associate
Goldwyn Global Strategies, LLC

Heather Coleman
Climate and Energy Director
Oxfam America

The Honorable John Conger
Advisory Board Member
The Center for Climate and Security

Tom Cunningham
Director of International Affairs
Statoil

Taylor Dimsdale
Head of Research
E3G

Samantha Dravis
Associate Administrator, Office of Policy
Environmental Protection Agency

Marnie Funke
Senior Government Relations Advisor
Shell Oil Company

David Goldwyn
President
Goldwyn Global Strategies, LLC

David Gordon
Adjunct Senior Fellow, Energy,
Economics, and Security
Center for a New American Security

Evan Harrje
Energy Analyst
Aramco Services Company

Alice Hill
Research Fellow
Hoover Institution

Elke Hodson
Policy Analyst, Office of Energy Policy
and Systems Analysis
U.S. Department of Energy

Ambassador Laura Holgate
Senior Fellow
Harvard Kennedy School Belfer Center
for Science and International Affairs

Andrew Holland
Senior Fellow for Energy and Climate
American Security Project

Logan Hollers
Legislative Assistant
Congresswoman Debbie Schultz

Ashley Johnson
Project Associate
The National Bureau of Asian Research

Marcus King
Associate Professor, Elliott School of
International Affairs
George Washington University

The Future of U.S. Climate Leadership

September 14, 2017

Center for a New American Security

David Kreutzer
Senior Research Fellow
The Heritage Foundation

Michael Leahy
Energy Policy and Planning Advisor
Chevron

Michael Leifman
Senior Strategist
General Electric

Jan Mares
Senior Policy Advisor
Resources for the Future

Brian Megali
Principal Market Analyst
Constellation Energy

Heather Messera
Senior Fellow for Government Affairs
The Center for Climate and Security

Jared Moore
Independent Researcher
Meridian Energy & Policy Consulting

Mack Moore
Manager, International Affairs and Political Risk
ConocoPhillips

Melanie Nakagawa
Head of Climate Initiative
Princeville Global

Richard Newell
President and CEO
Resources for the Future

Robert Nolan
Senior Government Relations Advisor
ExxonMobil

Divya Reddy
Practice Head, Global Energy & Natural Resources, Eurasia Group

Benjamin Reinke
Professional Staff Member
U.S. Senate Committee on Energy & Natural Resources

Rachel Rizzo
Research Associate, Transatlantic Security Program
Center for a New American Security

Elizabeth Rosenberg
Senior Fellow and Director, Energy, Economics, and Security
Center for a New American Security

Dr. Saleh Satti
Energy Analyst
Constellation Energy

Jake Schmidt
Director, International Program
National Resources Defense Council

Tracy Terry
Director of Energy
Bipartisan Policy Center

Edoardo Saravalle
Researcher, Energy, Economics, and Security Program
Center for a New American Security

Fabrice Vareille
Minister Counselor, Head of Transport, Energy, Environment and Nuclear Affairs Section
EU Delegation to the United States

Alan Yu
Director for Asian Affairs, Office of International Affairs
U.S. Department of Energy

AFTER PARIS

A Climate Agenda that Serves U.S. Interests

David F. Gordon, Divya P. Reddy, Elizabeth Rosenberg

CNAS
Celebrating 10 Years

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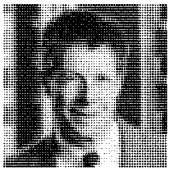
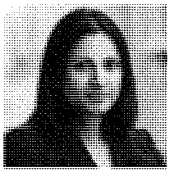
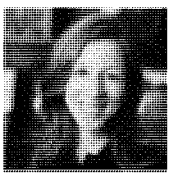
About the Authors



DAVID F. GORDON is an Adjunct Senior Fellow in the Energy, Economics, and Security Program at the Center for a New American Security (CNAS). Dr. Gordon is also an adjunct professor in the School of Foreign Service at Georgetown University. Formerly, Dr. Gordon served as Director of Policy Planning for Secretary of State Condoleezza Rice, after a distinguished career in intelligence culminating in his leadership of the National Intelligence Council. After leaving government service, Dr. Gordon was the Chairman and Head of Research at Eurasia Group, the global political risk advisory firm, where he is currently Senior Advisor.



DIVYA P. REDDY is the Practice Head for Global Energy & Natural Resources at the Eurasia Group focusing on global gas markets, North American energy policy, climate change and alternative energy, and metals and mining. Previously, she was a Research Associate at the Council on Foreign Relations and an Analyst at Bear Stearns & Co. covering oil, gas, coal, precious metals, and energy technology.



ELIZABETH ROSENBERG is a Senior Fellow and Director of the Energy, Economics, and Security Program at CNAS. Previously, she served as a Senior Advisor at the Department of the Treasury where she helped to develop and implement financial and energy sanctions, and as an energy policy correspondent at Argus Media where she analyzed U.S. energy policy, regulation, and trading, and OPEC production policy.

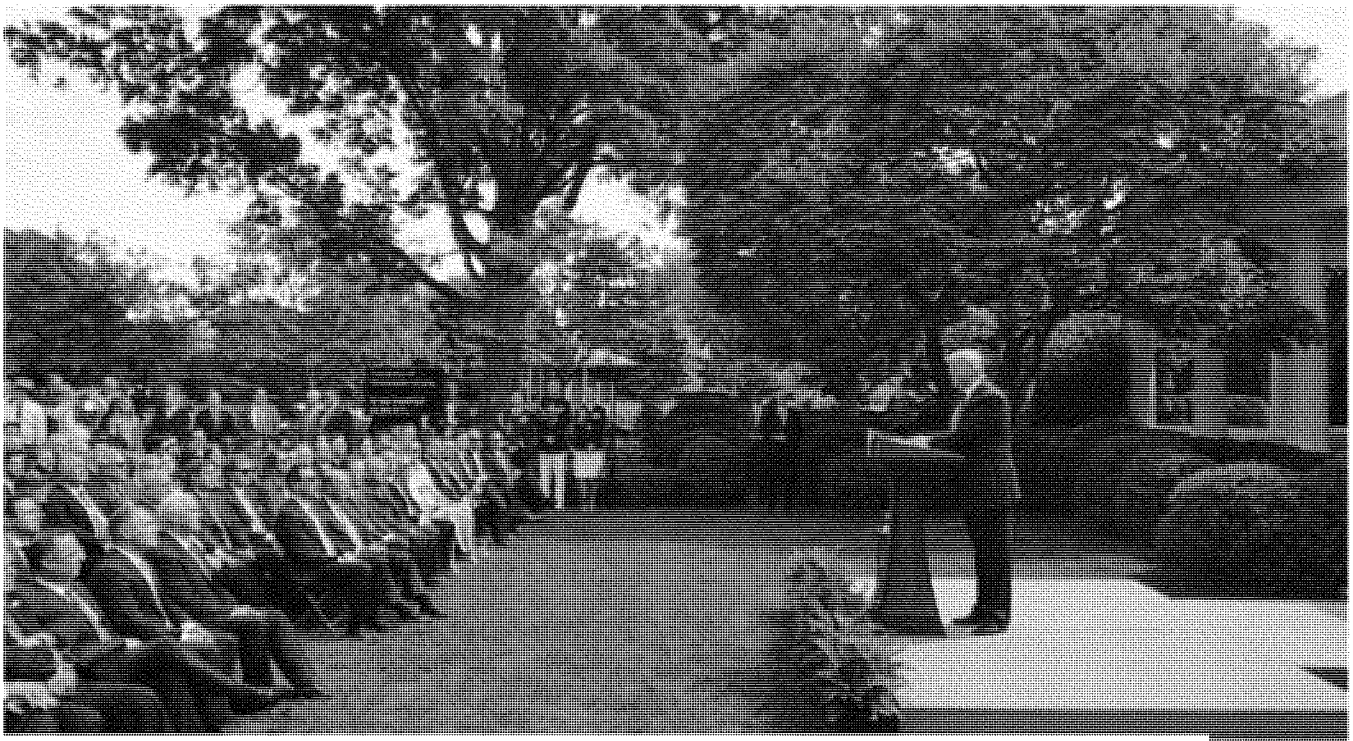
About the Energy, Economics, and Security Program

The Energy, Economics, and Security Program analyzes the changing global energy and economic landscape and its national security implications. From the shifting geopolitics of energy to tools of economic statecraft, such as trade policy and sanctions, to security concerns tied to a changing natural environment, the program develops strategies to help policymakers understand, anticipate, and respond. The program draws from the diverse expertise and backgrounds of its team and leverages other CNAS experts' strengths in regional knowledge, defense, and foreign policy to inform conversations in the nexus of energy markets, industry, and U.S. national security and economic policy.

Acknowledgments

The authors would like to thank Shawn Brimley for his review of this report. The authors would also like to thank Edoardo Saravalle, Neil Bhatiya, and Kaleigh Thomas for their research support and assistance. Finally, the authors would like to acknowledge Melody Cook and Maura McCarthy for their assistance with the production of this report.

Cover Photo
Lukas Schulze / Stringer



The dust is now settling on President Donald Trump's decision to have the United States withdraw from the Paris Agreement. (Chip Somodevilla/Getty Images)

Introduction

The dust is now settling on President Donald Trump's controversial decision to withdraw the United States from the 2015 Paris Agreement on climate change. This decision was a foreign policy mistake. It will make sustaining American credibility more difficult in other multilateral institutions and settings. It will exacerbate anti-American sentiment in Europe, making trans-Atlantic leadership collaboration more difficult well beyond climate policy. On climate, it threatens to undermine the balance achieved in Paris between the centralized and top-down approach favored by the Europeans and the more decentralized and market-friendly approach of the United States, which was supported by China. As a result, it also could lead to the creation of an uneven playing field for U.S. businesses.

While there is a need for the United States to deal with the geopolitical fallout from dropping out of the Paris Agreement, that is not the topic of this report. Rather, the report focuses more narrowly on climate policy issues facing the United States – both international and domestic – in the aftermath of leaving Paris. At this time, the starting point for effective policy should be to do what is principled yet practical. The strategic implication of this is to focus on *clean energy*, which is a concept that carries much broader support than other proposed solutions, given the unfortunate polarization of public opinion and, especially, U.S. elite-level politics concerning climate change. In this report, the authors seek to outline what such a politically viable agenda would look like.

The U.S. record on carbon emissions, especially from energy sources, tells a reasonably positive story, as the power sector burns less carbon-intensive coal and more low-carbon natural gas.[1] According to the Energy Information Administration (EIA), U.S. energy-related carbon dioxide emissions are expected to fall to 5,134 million metric tons (MMT) in 2017, the lowest since 1992.[2] The all-time peak of 6,021 MMT was in 2007.[3] This momentum on cleaner energy remains, in our view, politically sustainable, even given the likelihood of less action at the federal level. The key elements of a strategy to sustain and increase this momentum are outlined in the recommendations section of this report.

President Trump's announcement on leaving the Paris Agreement was followed by a speech promising to implement measures to expand domestic oil and gas drilling, thus enabling U.S. "energy dominance" in hydrocarbons.[4] His budget proposal would slash funding for the Advanced Research Projects Agency-Energy (ARPA-E), which has incubated enhanced research on renewable energy technologies.[5] These factors have

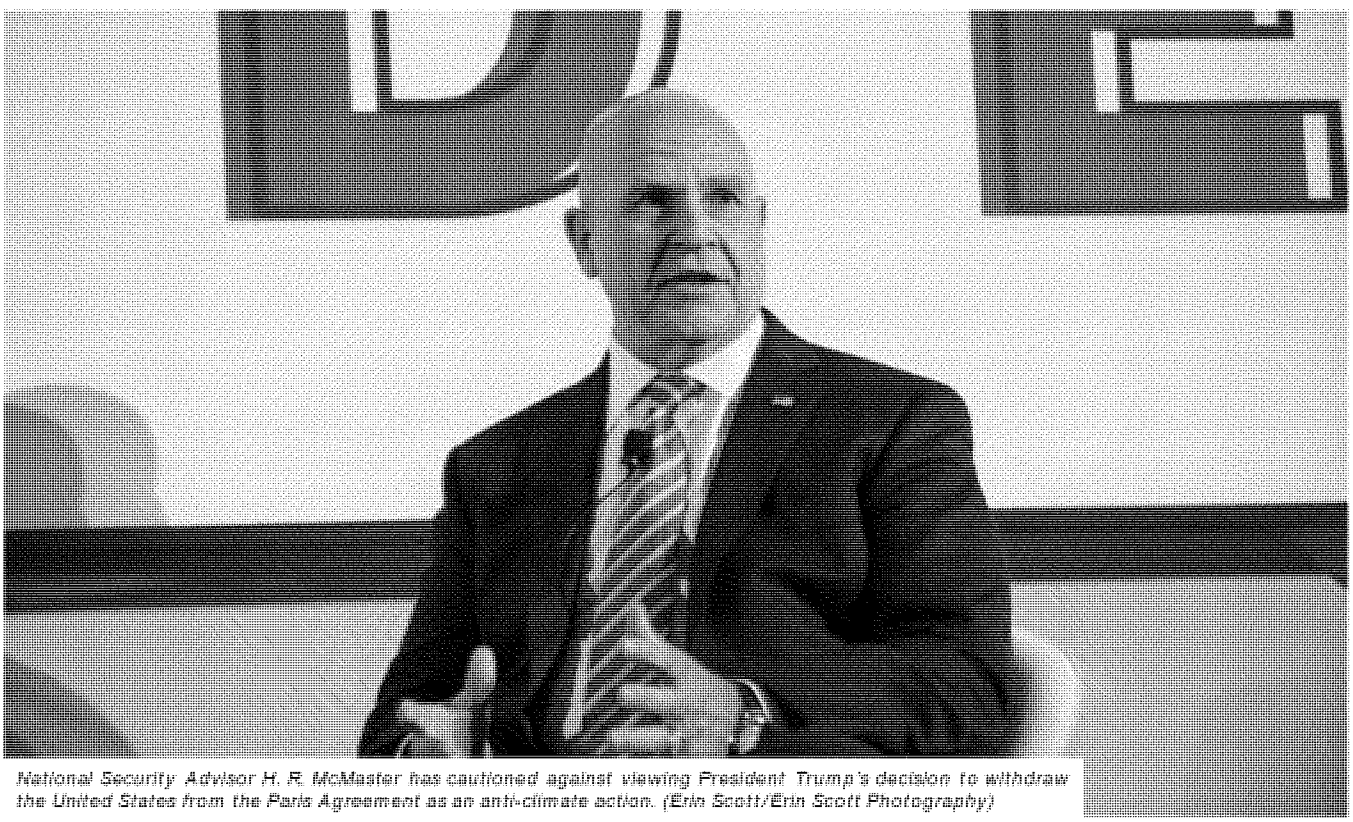
caused a great deal of anxiety around a series of conflicting implications of the president's moves, and how they might negatively affect U.S. interests both directly and indirectly:

1. Will the Paris Agreement start to fragment, with the United States being blamed, as was the fate of the Kyoto Protocol after President George W. Bush pulled the United States out shortly after taking the reins of power in 2001?
2. Will U.S. businesses experience substantial reprisals and increased reputational risk from being associated with the president's move?
3. Will China be able to take advantage of the U.S. withdrawal to provide leadership on global climate change, reinforcing Beijing's increasing global status as a constructive stakeholder at the expense of U.S. "soft power," especially with America's traditional allies in Europe?
4. Does President Trump's move represent a hardening of his views of climate change as a "hoax" and a conspiracy against U.S. manufacturing,[6] and will that lead to a narrowing of the political space for climate action in the United States by actors other than the federal government?

Momentum on cleaner energy remains politically sustainable, even given the likelihood of less action at the federal level.

There is reason to believe that worst-case outcomes are unlikely for any of these questions – even if some elements of each remain possible or even probable. In fact, there is still considerable scope for the administration to establish a position on climate change that advances U.S. interests under an "America First" paradigm. The administration can and should take more active steps to engage on the issue of climate change, even outside of the structure of the Paris Agreement. Recent statements by National Security Advisor H. R. McMaster cautioning against characterizing the president's decision on the Paris Agreement as "anti-climate" suggests there is still room for a post-Paris climate policy from the Trump administration.[7]

The first sections of this report focus on analyzing in some detail each of the four themes outlined above. Based on this analysis, the final section of the report offers a series of strategy and policy recommendations for carrying forward a climate-friendly clean energy agenda.



National Security Advisor H. R. McMaster has cautioned against viewing President Trump's decision to withdraw the United States from the Paris Agreement as an anti-climate action. (Erin Scott/Erin Scott Photography)

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The Paris Agreement Will Not Unravel

In the aftermath of the Trump decision, virtually all of the other key national governments – the major European powers, China, Russia, and India – each made definitive statements of continued commitment to the Paris Agreement and jointly reiterated their support during the G20 Summit in July 2017.[8] This was not inevitable; nor is it surprising. Because of the limited and varying degrees of commitment by different countries, Paris was structured as a voluntary agreement, with each country unilaterally determining its own actions. Framers of the agreement hoped that this feature of national determination of goals and actions would strengthen the commitment to implementation by each government, and perhaps even lead over time to a "race to the top" by incentivizing bolder action to enhance each country's reputation in global public opinion.[9] Indeed, it was this feature of the Paris Agreement that was the main argument used by U.S. supporters of remaining inside of the accord – that is, that they were flexible enough to accommodate virtually any actions the United States sought to pursue.[10]

Critics of Paris are correct in stating that the agreement reflects little more than what individual countries were likely to do anyway.[11] China and India committed only to reducing the emission intensity of their economies, rather than carbon emissions themselves, at least until 2030.[12] And many observers believe that Russia's convoluted method of measuring emissions will in practice lead to an increase in emissions.[13] Thus the unanimity of international support for Paris in the face of the U.S. withdrawal is really not so surprising; it was built into the design of the agreement. The implication: The Paris Agreement is not going away.[14] And, in contrast to the situation after the U.S. withdrawal from the Kyoto Protocol, President Trump's hope that a U.S. withdrawal will lead to a context where renegotiation becomes feasible is highly unlikely.

In contrast to the situation after the U.S. withdrawal from the Kyoto Protocol, President Trump's hope that a U.S. withdrawal [from the Paris Agreement] will lead to a context where renegotiation becomes feasible is highly unlikely.

Corporate America Can Partially Mitigate Its Own Fears

At the center of the business case for remaining in Paris were fears about the potential direct repercussions to which U.S. businesses might be vulnerable. The private sector also worried that, absent the U.S. presence at the Paris table, the evolution of thinking about how to respond to climate change would be dominated by the much more business-critical Europeans and the more statist Chinese and Indians. Because of this, despite the fact that many U.S. businesses support at least some of President Trump's walking back of the Obama administration's climate regulations (especially elements of the Environmental Protection Agency's Clean Power Plan) that they see as inhibiting investment, most of the U.S. corporate and financial community supported remaining in Paris.[15] Among the groups representing the major sectors of the U.S. business community, only the National Mining Association weighed in directly in support of exiting the Paris Agreement.[16]

What are the risks that U.S. businesses might face? To start, U.S. companies fear that they will be locked out of export opportunities if other countries decide to impose a border-adjusted carbon tax on manufactured goods from countries outside of the Paris Agreement (i.e., the

During her closing remarks at the G20 Summit in Hamburg in July 2017, German Chancellor Angela Merkel criticized the U.S. decision to withdraw from the Paris Agreement and affirmed a commitment to the agreement from the group's other 19 members. (Sean Gallup/Getty Images)

United States). Top among these markets at risk would be Europe, where last year some French electoral candidates backed this idea,[17] but the concept has also been floated by officials in Canada and Mexico.[18] While the likelihood of such a border levy is realistically very low, there are other ways U.S. companies could be locked out of opportunities overseas. U.S. companies could both find themselves at a disadvantage in high-end manufacturing of clean energy products and be blocked from procurement opportunities, notably in clean technologies. The International Energy Agency estimates that renewable power investments in 2015 alone were $313 billion,[19] and predicts that an additional $8.8 trillion will be spent through 2040 on renewable energy investments.[20] Moreover, the Green Climate Fund (GCF), established at the 2009 Copenhagen climate conference and reinforced through the Paris Agreement, had a goal to mobilize $100 billion annually in mitigation and adaptation efforts. The lack of U.S. participation in the GCF could preclude U.S. companies from participation in projects. At the very least, U.S. companies are worried that the U.S. withdrawal damages corporate America's brand and could hurt overseas sales, especially in countries or market segments that place a premium on environmental stewardship and sustainability (such as retail brands, and European markets).

But U.S. businesses' support for remaining in the Paris Agreement was not motivated narrowly by fear of reprisals. Even if most of these risks do not come to pass, the U.S. business community overwhelmingly believes that climate change is real, is committed to remaining actively in the game of responding to climate change, and is convinced that the U.S. private sector is uniquely positioned to lead on developing energy and climate-related technologies relevant not only to the United States, but to the rest of the globe.[21] As always, these companies will continue to work with the Trump administration on a wide range of issues, and will continue to push ahead with both climate mitigation and adaptation technologies. In fact, though China has come to dominate in solar and wind manufacturing, U.S. experience and technological know-how can still outcompete in areas such as carbon capture and storage (CCS) and electric vehicles. U.S. companies will also continue to factor the cost of carbon emissions into their business models in order to maintain their competitive edge globally and to protect themselves from the very real risk of reputational guilt by association with the Trump administration's exit from the Paris Agreement.

There Are Limits to China "Filling the Void"

There is little doubt that China sees the U.S. withdrawal from the Paris Agreement in the same way that it looked at the Trump administration's decision to not move forward on the Trans-Pacific Partnership (TPP) – as an opportunity to portray itself as a global good citizen and to demonstrate support for addressing a widely shared global economic and security challenge.[22] In particular, European states, whose publics give far greater salience to climate issues than publics in any of the other major countries in the world, are looking to China to take up the mantle of leadership in the face of the U.S. withdrawal

Even though they opposed U.S. withdrawal from the Paris Agreement, U.S. business leaders, including Apple CEO Tim Cook and Amazon CEO Jeff Bezos, pictured above, will continue to work with the Trump administration on a wide range of technology issues. (Chip Somodevilla/Getty Images)

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Chinese subsidies for solar power generation led to a rapid ramp-up of solar photovoltaic manufacturing capacity. This caused a global oversupply and price crash. (Kevin Frayer/Getty Images)

from Paris.[23] Europe knows that it cannot go at it alone on climate change, and that, as the world's largest emitter, China would make a good partner. In recent years, China has made a major – and successful – effort to become the global leader in several renewable energy sectors. In fact, Beijing's generous subsidies for solar power generation – and the over $100 billion that it channeled into renewables in 2015 alone – led to a rapid ramp-up of Chinese solar photovoltaic manufacturing capacity, which in turn led to a global oversupply and price crash that lifted the viability of solar power in markets across the world.[24] And now China is stepping up its foreign investments in renewables, just as many countries are eager to boost their own investments in that space.

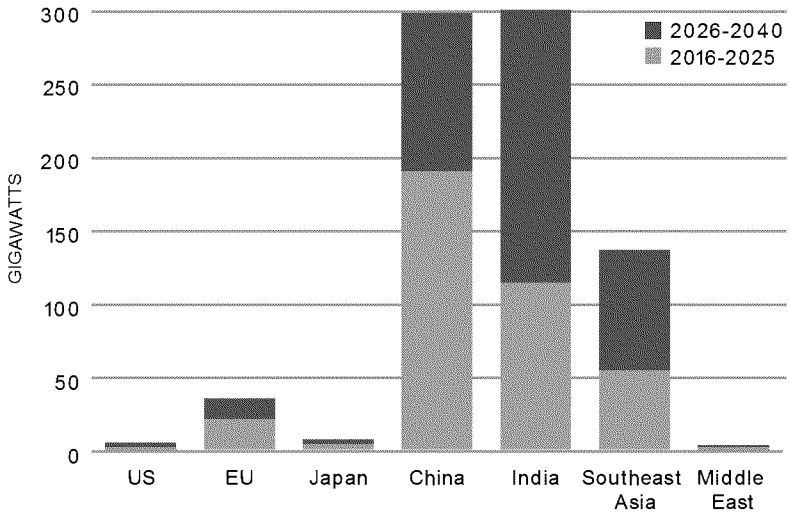
China is certainly poised to score some "soft power" points by highlighting its continued commitment to the Paris Agreement. But, as is the case on trade, Beijing is not prepared to take the policy steps that would allow it to move beyond symbolic statements into a more concrete leadership role on climate. The day following President Trump's statement withdrawing from Paris, visiting Chinese Premier Li Keqiang was unable to agree with his European hosts in Brussels on a joint statement on trade and climate change.[25]

Unlike in Europe and even in the United States, support for clean energy in China has been motivated much more by concerns (and political pressure) about urban pollution than a commitment to addressing global climate change.[26] Indeed, China has always been worried that commitments on limiting emissions could restrain its freedom of action in promoting economic growth, which the leadership continues to see as central to its overwhelming goal of maintaining political stability. That is not surprising given that coal remains by far the predominant source of energy and that millions of jobs are in China's legacy carbon-intensive industries.

Moreover, China's energy institutional infrastructure is still heavily biased toward coal (albeit relatively efficient coal plants), as opposed to renewable energy sources. Even if China caps coal-fired capacity in line with its targets, it will still represent 55 percent of total power generation and a whopping 1,100 gigawatts of capacity by 2020.[27] The challenge to move off coal is multifold, but it centers on the large fleet of existing coal-fired generation power plants that is far from retirement age in the context of the vast low-cost power needs of China's large and urbanizing population. Renewables have also struggled to connect to the grid, where price incentives still favor coal. And cleaner-burning gas is harder to access and more expensive to either produce at home or import from abroad. Finally, the coal sector is a large employer, and drastic off-coal policies are simply not politically feasible or realistic.[28]

For Chinese President Xi Jinping, the lure of his 2014 agreement with President Barack Obama to work together on climate was that a U.S./China-driven joint framework based on voluntary and nationally driven objectives might be able to replace the much more top-down and binding mandates that the Europeans had always sought in any global agreement, and that China was unwilling to accept. Indeed, the political geometry of the Paris Agreement was that the United States and China were able to dominate the European side of the climate triangle of the three largest economies. So the U.S. exit from Paris has a risk element for China as well as being an opportunity. As long as the United States was in, there was little chance of the substantially more aggressive European approach to climate change dominating the Paris process. Beijing's concern will create continuing opportunities for the United States to work with China on climate-related issues even after the announced exit from Paris.

GROSS COAL POWER PLANT CAPACITY ADDITIONS BY REGION [29]



The International Energy Agency's "New Policies Scenario" forecast suggests that coal will continue to play a major role in China and India's power generation mix well into the future.

Support for renewable energy in Republican states has been strong. Pictured above is a wind farm in Texas, the largest producer of wind energy in the United States. (Spencer Platt/Getty Images)

U.S. Climate Action Should Be Viewed as More Than Just Paris

Did President Trump pull the plug on Paris because he continues to believe that climate change is a hoax designed to undermine U.S. competitiveness? Or, as suggested in his statement, because he wants to gain leverage to negotiate a better agreement? Just as likely, he could have been motivated by wishing to shore up the substantial nationalist/populist component of his political base in the face of the continuing pressures from the Russia investigations and his pique at the European leaders who were relentless with him on climate change at the recent G7 meeting. We will probably never know.

In a politically divided America, the distance between Republicans and Democrats on the imperative to address climate change has grown wider in recent years. The salience of climate issues has been substantially increasing in primarily Democratic geographies,[30] where there has been a host of efforts at the municipal and state government levels to promote energy conservation and renewable energy technologies and industries.[31] And national-level Republican thinking on climate change action turned sharply more skeptical after the 2008 presidential campaign in which Sen. John McCain ran on a platform that included doing more on climate.[32]

But Republican support for clean energy has been more resilient. In Republican-leaning states, such as Texas, state support for renewable energy has been strong, but it is not motivated by a mandate to address

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climate change.[33] With the federal government stepping back from Paris, the significance of state and local actions will grow. Already a coalition of governors and mayors has pledged that it will mandate actions that, in sum, will go a long way to meeting the U.S. commitment to reduce carbon emissions made by the Obama administration.[34]

These actions are in the best tradition of American federalism, with its substantial delegation of political authority to state and local governments. In recent years, we saw this at work in different geographies' responses to hydraulic fracturing, or "fracking," for shale gas and oil. Federalism enabled the resurgence of U.S. oil and gas production – and the economic and strategic benefits that accrued from this – by allowing growth in states that supported fracking. At the same time, federalism ensured that in those geographies where public opinion was opposed to such efforts, state and local authorities would have the ability to put in place effective restrictions. Before the November 2016 election, several states and localities were preparing a "federalist" defense of fracking in light of Hillary Clinton's stated intentions to further restrict oil and gas production.[35] They had the Constitution on their side. Now, so will more environmentally minded states and cities, which will increasingly become the focal point for climate activism, at least until the midterm elections in 2018.

President Trump's actions will likely lead to an increase in climate-related actions by state and local governments where support for such actions is strongest.

Beyond state and municipal action, companies will continue to invest in clean technologies. One of the biggest advantages the United States has to address greenhouse gas emissions both at home and abroad is its abundance of natural gas from shale formations. Yet, the green credentials of natural gas are increasingly under threat by environmental groups that are concerned over methane emissions. Luckily for U.S. gas producers, the industry is already technologically well positioned to address the issue and prevent future administrations from targeting natural gas production over methane emissions.

So, despite the U.S. withdrawal, the Paris Agreement will remain in place. This is positive for U.S. interests, given that the negative backlash against the United States would have been much greater had the accord begun to disintegrate. U.S. businesses may face some limited reprisals, but the continued commitment of the U.S. corporate and financial communities to climate change action will minimize the risk, and U.S. businesses (along with state and local governments) will become the focal point for action on climate, especially in the technology sphere. While China will gain some "soft power" benefits from the U.S. withdrawal, Beijing is not really positioned to lead on climate, and it is not prepared to support Europe's much more aggressive climate agenda. Finally, President Trump's actions will likely lead to an increase in climate-related actions by state and local governments where support for such actions is strongest, which is precisely how the U.S. federal system is supposed to work.

Policy Recommendations

The Trump administration can and should embrace the clean energy agenda, because it both supports a strong and resilient economy at home and advances a compelling set of U.S. interests abroad, consistent with the administration's articulation of its "America First" paradigm. The United States is a primary testing ground for CCS and a leader in fracking technology and methane capture; each of these technologies holds the potential for major positive impacts on the domestic economy, while enhancing U.S. global standing and attractiveness to other countries.

As was the case during the last administration, the biggest opportunity on the international side remains enhancing cooperation with China. While China will be eager to cooperate with European powers on climate issues, the country remains wary of the European approach and will want to keep the United States in the climate game.

Climate and clean energy are policy areas in which U.S. cities and states have expressed, and will continue to express, a range of preferences. This diversity has already been positive for the United States, and it will continue to provide room to maneuver for the new administration, even as it prevents the politics of climate from having a more corrosive impact on the broader body politic.

At the national government level, the report focuses on recommendations in three areas: addressing the methane issue in natural gas to enable this important

fuel to bolster both the U.S. economy and climate change efforts; maintaining a tax regime favorable for continued technological innovation for renewable energy sources; and ensuring that U.S. vehicle efficiency rules remain competitive for global markets.

1. Rename, refocus, and elevate the U.S.-China Renewable Energy Partnership (USCREP) to become the U.S.-China Clean Energy Partnership.
Despite the U.S. exit from the Paris Agreement, the United States-China-Europe climate triangle will still provide opportunities to support U.S. diplomatic, economic, and commercial interests, especially vis-à-vis China. Beijing will continue to remain somewhat wary of European intentions on climate and eager to cooperate, especially on the technology and investment side, with the United States.

While keeping one of its foci on renewables, what has been the technically focused USCREP partnership should be upgraded to a more political forum. Its focus should be broadened to include how U.S. clean coal technology and natural gas exports can help China achieve its clean air goals while at the same time fulfilling its Paris commitment to lowering the carbon intensity of its economy. On the clean coal front, the initiative should focus on facilitating the transfer and uptake of CCS technologies in China's still-enormous coal industry. At the same time, expanding trans-Pacific U.S. natural gas exports will give China increased confidence concerning the reliability and price competitiveness of natural gas, increasing the incentives to substitute gas for the more carbon-emission-intensive coal.

The new partnership would also focus on broader issues of clean energy, such as ensuring that international and Chinese investments in President Xi Jinping's Belt and Road Initiative are sensitive to the danger of it creating a dumping ground for greenhouse gases. Finally, clean energy themes should become one of the focal points of Treasury Secretary Steven Mnuchin's recent commitment to restart the stalled negotiations around creating a U.S.-China Bilateral Investment Treaty.

2. Avoid restricting the political space for state and local action on climate.
There is little doubt that opponents of action to prevent and mitigate the effects of climate change will seek to counter the recent groundswell of support for state and local governments becoming more directly engaged in climate activities. Most of this will be politics as usual, reflecting the deep divisions in the country over the issues. As this paper has discussed, this division is substantially geographic, and one of the goals of the U.S. federal political structure is to enable different states and localities to express different political preferences and policy choices.

But some hardline opponents of climate change mitigation are likely to raise the argument that state and local action on climate is in violation of the constitutional principle that foreign policy decisions and choices reside at the federal level, and, in particular, with the executive branch. These voices will point to the likelihood that U.S. mayors and governors who are taking strong actions on climate will participate more heavily in various international fora around climate. And foreign leaders, committed to bolstering the Paris Agreement, will be seeking the validation of continuing U.S. engagement on climate despite the president's withdrawal from Paris. The recent meeting in Beijing between California Governor Jerry Brown and President Xi is the tip of what will be a very big iceberg.[36]

The important point of principle here is whether or not the direct actions taken by state and local authorities are beyond the scope of the competence that resides in those levels. State and local authorities have a great deal of discretion over air quality issues and thus over carbon emissions. What they cannot do, of course, is claim to be representing the foreign policy of the United States.

But the fact remains that taking action on climate change is supported by a substantial majority of the

State and local decisionmakers like California Governor Jerry Brown, pictured above meeting Chinese President Xi Jinping, are taking strong action on climate, including coordination with major emitting nations. (Pool/Getty Images)

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American public,[37] and even the president has said that his views on the subject are "evolving."[38] It would be unfortunate, and probably a major political mistake, were the federal authorities to make any attempt on constitutional grounds to restrict the rights of governors, state legislatures, and local authorities to take action on climate change.

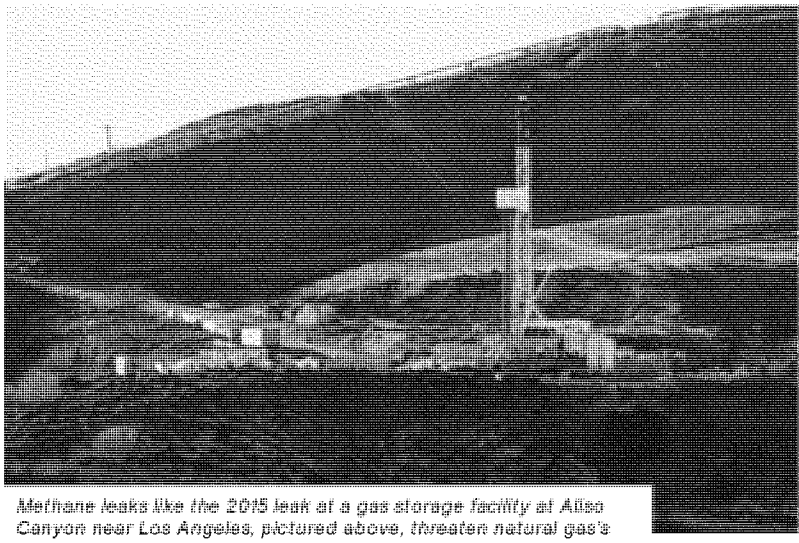
Beyond purely constitutional grounds, the Department of Energy under Secretary Rick Perry launched a study into whether policy support for renewables, including at the state level, threatens baseload coal and nuclear generation and, along with it, grid reliability.[39] While the study may very well highlight vulnerabilities from intermittent renewables, it is still in the best interest of the federal government to avoid political intervention in state policies and instead defer to regulatory bodies, such as the Federal Energy Regulatory Commission, to address grid stability concerns in a purely technical context.

Importantly, state clean energy policies can also have the advantage of creating globally competitive companies in clean technology fields, including solar, wind, smart grids, and electric cars.

3. Develop an action plan for developing technologies to capture the methane released during the production, delivery, and use of natural gas.

The increase in natural gas production globally – and the growing maturity and depth of natural gas markets from supply availability to trading and pricing – is making gas an attractive alternative to coal as an energy source. But the credibility of natural gas as a clean alternative to coal is being challenged by those who focus on the fact that natural gas leaks methane during its production and use.

Though methane lives in the atmosphere for a much shorter period than carbon dioxide, it has a much higher greenhouse gas potency, assigning it a significantly higher global warming score. As a result, the growth in methane emissions from oil and gas production in the United States has been a focus of environmental groups. The Obama administration took federal actions to impose methane limits on oil and gas wells and related infrastructure, raising concerns among producers about onerous costs. The current administration is keen to roll those policies back, but there is still an opportunity for the United States to take advantage of the notable progress to detect and capture methane already achieved by U.S. industry. In particular, the EPA's Natural Gas STAR program has helped encourage the development and deployment of methane reduction technologies.



Methane leaks like the 2015 leak at a gas storage facility at Aliso Canyon near Los Angeles, pictured above, threaten natural gas's credibility as a clean alternative to coal. (Scott L/Getty Images)

Beyond the environmental benefits of methane reduction is the revenue of the methane that many states and companies are eager to capture. This would otherwise be lost without sensible regulations. The Trump administration should allow states such as Colorado and Pennsylvania that have already imposed methane regulations on their oil and gas sectors to keep them in place. The technological advancements achieved in this area will be of great interest to other oil- and gas-producing countries that experience a considerable loss of natural gas revenues from methane releases. The Environmental Protection Agency should not only uphold the Global Methane Initiative, which extended the Natural Gas STAR program internationally in 2006, but also expand its reach to more countries.

4. Maintain federal support for renewable technologies.

The Trump administration has already begun to scale back incentives for renewables put in place under President Obama's Clean Power Plan.[40] Though renewables technologies, namely solar and wind, are becoming more price-competitive, investment in new technologies still needs to be driven by policy support. Moreover, existing federal production tax credits for wind and investment tax credits for solar still drive new investment; without those credits, the investment pipeline would dry up considerably.[41] As a result, Congress should resist attempts to partially finance a reduction in the corporate income tax by eliminating these tax credits. Instead, as renewable technology gains further cost competitiveness against traditional power sources, the tax credits can be phased down, perhaps along an

accelerated trajectory, or diverted to new "breakthrough" technologies. Lazard's latest estimate for levelized cost of electricity (LCOE) for unsubsidized onshore wind is $32/megawatt-hours (MWh) to $62/MWh, which makes it more competitive than a combined-cycle natural gas plant at $42/MWh to $85/MWh.[42] Solar has also made impressive headway at $46-$56/MWh for thin-film utility scale (with higher costs for other forms of solar technology).[43] Nonetheless, the LCOE calculation is simplistic and does not reflect the intermittency of renewables, which makes gas plants still more economical when capacity factors are taken into consideration.

Along these lines, both the administration and Congress should avoid the pitfalls of conflating the promotion of clean energy technologies with the debate on climate change. A number of Republican states are moving away from this association and supporting renewable energy policies, even if they do not support U.S. action on climate change from an international perspective. The reason for this trend is that the renewables sector has driven economic growth and job creation, especially in historically disadvantaged rural communities. The American Wind Energy Association estimates that rural landowners who lease property to wind farms earn over $245 million annually.[44] Recent moves by Republican governors in Illinois and Michigan to advance renewables further highlight this trend. In both cases, the governors supported improvements to their states' renewable portfolio standard as part of broader energy bills.[45] The administration should also heed the calls of the Governors' Wind & Solar Energy Coalition, which represents a bipartisan group of state governors, to increase federal funding for grid modernization to support renewables, clean energy research, and promotion of offshore wind, and to facilitate easier permitting for renewables projects.[46] Such efforts will smooth the integration of renewables into the energy mix and open the door to new and potentially high-impact renewables technologies such as offshore wind, as well as digital applications for integrating distributed renewables resources into modernized grids.

5. Ensure that U.S. fuel efficiency standards and other regulations for vehicles do not put automobile export sales at risk.

The federal government will not be doing U.S. automobile manufacturers a favor if fuel efficiency standards and other regulations are set so low that U.S.-produced vehicles face a non-level playing field in export markets. The global trend on vehicle fuel efficiency is for tighter standards. If U.S. automakers want to tap opportunities in large markets such as China and Europe, they will need to produce cars on par with the global norm. While the Obama administration's standard of 54.5 miles per gallon by 2025 put the United States closer to global best-in-class status, softening the standards would cause the United States to fall further behind the global trend.[47] As such, the new administration should avoid excessive loosening of existing standards and instead offer auto-makers greater flexibility on meeting the targets.

States' rights questions will come into play on this issue. California and nine other states have affirmed their commitment to the current targets, and they have authority to do so based on a previous waiver granted to them by the EPA. Efforts to revisit the waiver would likely open up a legal quagmire that would be best avoided, so the administration should seek a negotiated settlement with states that recognizes their desire to maintain a tighter standard and avoids creating an extended period of patchwork standards across the country, which would be a worse outcome for auto manufacturers.

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Conclusions

President Trump's move to withdraw the United States from the Paris Agreement was a foreign policy mistake, but it by no means marks the demise of the climate agenda, either at the international level or in the United States. Even in the short time since President Trump's announcement, it has become clear that the Paris Agreement will remain in place as the principal international focal point for climate-related actions. And, if anything, the president's move has reinforced the commitment of businesses, state and local governments, and civic organizations to take action to prevent and mitigate climate change.

This report has argued in favor of a "principled, yet pragmatic" approach to U.S. policy focusing on promoting clean energy, around which public opinion is less polarized than it is on climate action per se. Internationally, a U.S. clean energy agenda will be especially attractive to China because it directly supports that country's efforts to address poor air quality and other forms of environmental degradation, which is an increasingly politically sensitive and challenging issue. Furthermore, the United States' role as a source of clean coal technology and increasing natural gas exports will be very attractive to Beijing.

Domestically, the key issue will be to ensure that the energies of the private sector and state and local governments are focused on this agenda. Perhaps more than any other issue, climate and clean energy are ripe for an entrepreneurial period of more intensive local leadership. Specifically, this report highlights the importance of methane capture technology development for sustaining the growth of the natural gas market; the continuing need for early-phase tax incentives for the deeper penetration of renewable energy; and keeping the U.S. auto industry globally competitive.

These policies are consistent with the Trump Administration's "America First" foreign policy framework, and they will make the United States a continuing partner and a net positive contributor to the global struggle against climate change.

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ED_001523_00007358-00016

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ONE Future Comments to Proposed OOOOa Rule-FINAL-4Dec2015.pdf

Samantha,

Thank you for visiting with us yesterday. I wanted to share with you (and Mandy) our comments on the NSPS OOOOa. Please refer to Recommendations 1, 2 and 5 in our comments.

We look forward to working with Mandy and yourself in improving the methane policies and programs. Since I do not have Mandy's email, I would appreciate if you could share these comments with her.

If you have any further questions, please do not hesitate to contact us.

Kind regards,,

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December 4, 2015

U.S. Environmental Protection Agency
EPA Docket Center (EPA/DC)
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
Attention: Docket Number EPA-HQ-OAR-2010-0505

Re: ONE Future Comments on Proposed Rule for New Source Performance Standards, Oil and Natural Gas Sector: Emission Standards for New and Modified Sources 80 Fed. Reg. 56593.

Dear Mr. Moore:

Our Nation's Energy Future Coalition, Inc. (ONE Future) appreciates the opportunity to comment on the U.S. Environmental Protection Agency's (EPA or the Agency) proposed standards of performance for emissions of methane and volatile organic compounds (VOCs) from new, modified and reconstructed sources in the oil and gas sector. [1]

ONE Future is a unique coalition of leading companies with operations in one or more of the following four principal segments of the natural gas industry: (1) oil and natural gas production and gathering; (2) natural gas processing; (3) natural gas transmission and storage; and (4) natural gas distribution. ONE Future is a non-profit 501(c)(6) trade group that is focused exclusively on improving the management of methane emissions from the wellhead to the burner tip. By bringing together companies from every segment of the natural gas value chain, we aim to deploy innovative solutions to operational and policy challenges that will deliver better results to our customers, increase value to our shareholders, and improve the environment.

ONE Future's flexible and performance-based approach to the management of methane emissions begins with the establishment of an ambitious goal: by the year 2025, our member companies aim to achieve an average annual methane emission intensity[2] rate across our collective operations that, if achieved by all operators across the natural gas value chain would be equivalent to one percent or less of gross U.S. natural gas production. (To put this into perspective, natural gas sector emissions totaled

[1] Oil and Natural Gas Sector: Emission Standards for New and Modified Sources, 80 Fed. Reg. 56,593 (Sep. 18, 2015) ("Proposed OOOOa Rule" or "Proposed Rule").
[2] In these comments, the term "emission intensity" refers exclusively to the average methane (CH4) emission rate over total methane throughput (as reported to the U.S. Energy Information Administration) in a given system.

approximately 1.49 percent of production in 2012.[3]) ONE Future established the one percent emission intensity goal for several reasons: first, the one percent intensity goal is ambitious and would be consistent with an entire supply chain that is highly efficient and performing optimally. Second, although the goal is ambitious, we believe it is both technically and economically feasible using existing technology and practices. Third, recent peer-reviewed research has suggested that an average industry-wide emissions rate of one percent or less would ensure that using natural gas provides immediate greenhouse gas reduction benefits as compared to any other fossil fuel, in any other end-use application.[4]

Importantly, we believe that orienting our activities toward this specific and measurable outcome ensures a sustained focus on identifying the opportunities for emissions abatement that yield the greatest benefit for the least cost. It grants individual companies the flexibility to choose precisely how they can most cost-effectively and efficiently achieve their goal – whether that be by deploying an innovative technology, modifying a work practice, or in some cases, replacing a high-emitting asset with a low-emitting asset. The only essential aspect of our program is that companies transparently demonstrate progress toward their emission intensity goal. (To this end, ONE Future is developing a Methane Emission Intensity Estimation Protocol that will largely utilize existing EPA methodologies to calculate company emissions, which we expect to publish publicly as part of the proposed Methane Challenge program.)

ONE Future member companies believe strongly that the flexible, performance-based approach we have proposed will accomplish deeper emission reductions among participants more quickly, and at a lower cost, than a one-size-fits-all mandatory program. We strongly encourage EPA to ensure that the proactive leadership of ONE Future member companies is acknowledged and recognized as they devise current and future regulatory actions in this arena.

Below you will find our detailed comments on your proposal. We appreciate the opportunity to provide comments on behalf of the ONE Future Coalition.

Tom Michels
Executive Director
ONE Future Coalition

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[3] This figure is based on emissions data from the 2012 U.S. EPA inventory of GHG emissions (GHGI), accounting for co-allocation of emissions from associated gas originating at oil wells and lease condensates from gas wells, and 2012 natural gas gross withdrawals as reported by the U.S. Energy Information Administration (EIA).

[4] See for example: Alvarez et al. (2012) *"Greater focus needed on methane leakage from natural gas infrastructure."* *Proceedings of the National Academy of Sciences*. (http://www.pnas.org/content/early/2012/04/02/1202407109.abstract) Note that while ONE Future may not accept every conclusion of this study, we believe its findings are sufficiently robust to serve as a guidepost for our aspirational target.

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COMMENTS ON THE PROPOSED OOOOa RULE

RECOMMENDATION 1: THE EPA SHOULD EXCLUDE LOW-EMITTING FACILITIES FROM THE NSPS OOOOa FUGITIVE EMISSIONS STANDARDS AND REQUIREMENTS.

ONE Future's flexible, performance-based system focuses on identifying the most cost-efficient and cost-effective abatement opportunities first, in order to yield the greatest emission reductions, in the shortest amount of time, and at the lowest cost. A natural corollary to this is to eschew wasteful expenditures of capital and manpower whenever possible. It is for that reason that we urge EPA to exclude all low-emitting facilities from the proposed OOOOa standards and requirements related to Fugitive Emissions.

The Proposed OOOOa Rule already excludes the following facilities from regulation on the grounds that the facilities have low emissions and therefore there is minimal benefit from subjecting them to additional NSPS requirements:

1. Low production wells[5];
2. Wells with a gas-to-oil ratio (GOR) of less than 300 scf of gas per barrel of oil produced[6]; and
3. Well sites that only contains one or more wellheads (i.e., Christmas trees)[7]

The EPA is considering additional exclusions. The preamble to the Proposed Rule seeks "comment on whether there are well sites that have inherently low fugitive emissions, even when a new well is drilled or a well site is fractured or refractured."[8]

The Court of Appeals for the District of Columbia Circuit (D.C. Circuit) has recognized that such *de minimis* exceptions allow agency flexibility in interpreting a statute to prevent "pointless expenditures of effort."[9] These *de minimis* exceptions from the requirements of a regulation may be permissible "as an exercise of agency power, inherent in most statutory schemes, to overlook circumstances that in context may fairly be considered *de minimis*."[10]

In the preamble to final OOOO rule, EPA explains that the *de minimis* doctrine can apply when the source has emission controls in place that are "equivalent to those required for a new source" because,

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[5] The Proposed Rule defines "low production well" as a well with an average daily production 15 barrels of oil equivalent or less. Proposed Rule at 56,633 fn. 90.
[6] Proposed Rule at 56,611.
[7] Proposed Rule at 56,611.
[8] Proposed Rule at 56,639.
[9] *Alabama Power Co.* v. *Costle*, 636 F.2d 323, 360 (D.C. Cir. 1979)
[10] *Id.*

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in such a situation, imposing NSPS controls on the source would not yield additional regulatory or environmental benefits.[11]

Therefore, EPA has a firm legal basis for granting *de minimis* exceptions to inherently low-emitting facilities.

In this rule, we urge the EPA to extend the *de minimis* exception to any of the affected sites/facilities with a *potential to emit* less than the values listed below, which are principally derived from the potential uncontrolled rates from the Technical Support Document (TSD):[12]

Table 1: Low Fugitive Methane Emissions Facility Threshold

Segment	Low Fugitive Methane Emissions Facility Threshold *(metric tons per year, CH_4)*	Comment
Natural Gas Well Site	4	Per well[13]
Oil Well Site	4[14]	Per well
Gathering & Boosting	35	Per station
Transmission	62	Per Compressor Station
Storage	164	Per Storage facility

A site's Potential to Emit can be readily quantified and estimated. In order to establish a given site's potential to emit, a company can use either EPA's GHGRP emission factors or factors generated by direct measurements of the leaks employing generally accepted techniques such as HI Flow samplers at company facilities to develop its potential-to-emit estimates. As long as the potential-to-emit from the fugitive emission source is below the thresholds in Table 1, the facility should qualify for the low-emitting facility exception. Should additional wells or compressors be added to the facility, the facility will review its status against the *de minimis* thresholds in Table 1. Any increase above the threshold will make the facility subject to the fugitive emissions standards.

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[11] *Id.* citing *Environmental Defense Fund, Inc. v. EPA*, 82 F.3d 451, 466 (D.C. Cir. 1996).
[12] *Oil and Natural Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution, Background Technical Support Document for the Proposed New Source Performance Standards, 40 CFR Part 60, subpart OOOOa* available in the docket at http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2010-0505-5021.
[13] See Proposed Rule at 56,637. EPA estimates 700 components at a well site. Table 5-7 of the TSD estimates a "Model Well Site" with 2 well-heads and 548 components to have potential uncontrolled emissions of 4.54 tpy. Extending the ratio of these different components to 700 yields a total of 8 tpy for a 2 well-pad site or 4 tpy per well. ONE Future further contends that it makes no sense to have a different or lower threshold for oil well sites than for gas well sites
[14] Note that while the calculations from Table 5-7 would indicate a 1 tpy threshold for oil well sites, we believe it makes little sense to impose a different *de minimis* exclusion threshold on oil and gas sites.

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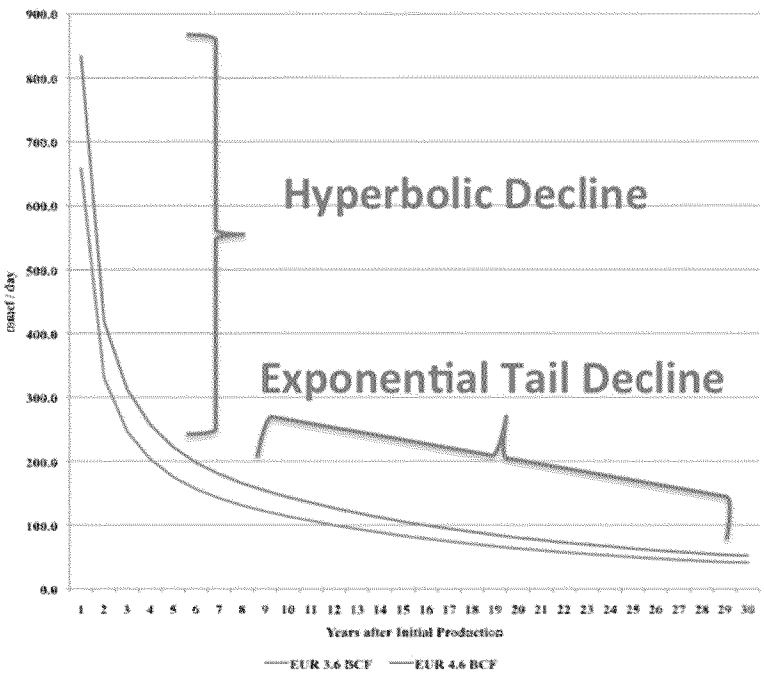
Notably, as part of the proposed Methane Challenge ONE Future commitment option, ONE Future companies will be estimating their emissions, even those not currently reported to the GHGRP due to being below threshold or simply not included. Additionally, ONE Future has also urged EPA to support and facilitate the usage of direct measurements as part of the Methane Challenge, which would facilitate this process.

EPA can have a reasonable assurance that a low-emitting facility cannot exceed its applicable potential emission threshold and therefore continue to qualify for the exception. The general NSPS definitions under 40 C.F.R. §60.14(a)(b) focus on modifications and increases in emission rate "expressed in kg/hr of any pollutant discharged….". The EPA has upheld this concept of design rate and emissions increases in numerous determinations found in the search of the Applicability Determination Index (ADI).[15]

A low-emitting well site's potential to emit fugitive emissions will not exceed that of its initial period of oil and natural gas production. In order to illustrate why this is the case for well sites, Figure 1 depicts the typical production decline curve over the lifetime of a natural gas well. As the figure clearly shows, the *potential* for fugitive emissions is highest during the initial period of production, which is a fundamental characteristic of shale wells. Hence, such facilities, which by their physical or operating conditions have a low potential to release fugitive methane emissions, should be excluded.

Figure 1: Illustrative Production Decline Curves for Shale Gas Wells *(Source: Penn State University)*



The application of stringent rules to wells with a low potential for fugitive emissions constitutes an inefficient expenditure of capital and resources that could be better utilized elsewhere to achieve greater environmental benefit. Regrettably, however, the Proposed Rule applies uniform costs and management effort across all new, modified, and reconstructed assets on a perpetual basis, regardless of their potential emissions over time.

In the recent past, EPA has acknowledged the fact that emissions

decline over time in conjunction with declining well production, and created alternative standards within the relevant NSPS to accommodate changes in how compliance is demonstrated. For example, in its 2013 updates to the Subpart OOOO Rule, EPA established an Alternative Emissions Limit for storage vessels. This provision allows operators to either reduce VOC emissions at a tank by 95 percent, as was required in the 2012 rule; or alternatively, to demonstrate that emissions from a tank have dropped to less than 4 tons per year of VOCs without emission controls.[16] If a storage vessel's uncontrolled VOC emission rates are demonstrated to be less than 4 tpy for at least 12 consecutive months, then the facility can remove the prescribed emission controls. As EPA wrote at the time, "This alternative limit reflects the decline in emissions that occurs at most tanks over time and allows owners/operators to shift control equipment to higher-emitting tanks."[17] Anti-backsliding provisions were included such that if emissions subsequently increase over 4 tpy, the source would need to comply with the NSPS standards.

Anti-backsliding provisions are already accounted for in OOOOa. EPA's proposed OOOOa requirements for Fugitive Emissions, already includes a benchmark for determining whether emissions have increased at an inherently low-emitting source and therefore backsliding has occurred. This benchmark is the "modification" definition. For purposes of the OOOOa Rule, EPA has proposed to define "modification" for well sites as follows, "For the purposes of these fugitive emissions standards, a modification would occur when a new well is added to a well site (regardless of whether the well is fractured) or an existing well on a well site is fractured or refractured."[18] EPA later justifies this decision by stating:

> *"When a new well is added or a well is fractured or refractured, there is an increase in emissions to the fugitive emissions components because of the addition of piping and ancillary equipment to support the well, along with potentially greater pressures and increased production brought about by the new or fractured well.* ***Other than these events, we are not aware of any other physical change to a well site that would result in an increase in emissions from the collection of fugitive components at such well site.****"*[19] (Emphasis added.)

Similarly, EPA concludes there will be an increase in fugitive emissions at an existing compressor station only when an operator adds an additional compressor or compression capacity:

> *"..[A] modification occurs only when a compressor is added to the compressor station or when physical change is made to an existing compressor at a compressor station that*

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[16] Oil and Natural Gas Sector: Reconsideration of Certain Provisions of New Source Performance Standards, 78 Fed. Reg. 58,416 (Sep. 23, 2013).
[17] "Final Updates to Requirements for Storage Tanks Used in Oil and Natural Gas Production and Transmission" EPA Fact Sheet accessed here: http://www3.epa.gov/airquality/oilandgas/pdfs/20130805fs.pdf
[18] Proposed Rule at 56,612.
[19] Proposed Rule at 56,614 (emphasis added).

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increases the compression capacity of the compressor station. Since fugitive emissions at compressor stations are from compressors and their associated piping, connections and other ancillary equipment, expansion of compression capacity at a compressor station, either through addition of a compressor or physical change to the an existing compressor, would result in an increase in emissions to the fugitive emissions components. ***Other than these events, we are not aware of any other physical change to a compressor station that would result in an increase in emissions from the collection of fugitive components at such compressor station."*** [20]***."*** (Emphasis added.)

Therefore, EPA can have a reasonable assurance that unless there is a "modification" at these low-emitting sites, there will be no increases in fugitive emissions from the time the facility is placed in service.

Considering the above, we urge the EPA to exclude low-emitting facilities from NSPS OOOOa standards for fugitive methane emissions. In so doing, EPA will permit a more efficient allocation of capital and resources that will facilitate operators to address more cost-effective abatement opportunities elsewhere in their system.

RECOMMENDATION 2: EPA SHOULD CREATE AN "OFF-RAMP" FOR LOW-EMITTING FACILITIES.

ONE Future urges EPA to provide an "off-ramp" out of the proposed OOOOa Fugitive Emissions requirements for those well sites and compressor stations that may transition into "Low-Emitting Facility" status, once their potential emit diminishes to a level equal to or less than the applicable thresholds we have identified in Table 1.

Establishing an off-ramp would acknowledge the natural decline curves associated with certain sites, and the attendant reductions in a sites potential to emit. Such facilities would be freed of some of the stringent and prescriptive fugitive emission requirements proposed in OOOOa, and could instead be managed under a more data-driven and risk-based inspection schedule that is more appropriate to the facility's profile. Without such a provision, companies would realize progressively diminishing returns (as measured in abated emissions) on the significant capital expenditures required by the Proposed Rule.

While the "once in, always in" concept is a construct of hazardous air pollutants under Section 112 of the Clean Air Act, it has not traditionally been applied in the context of Section 111 NSPS regulations. The policy was enacted in the context of Section 112 to prevent anti-backsliding at sources

[20] Proposed Rule at 56,614.

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that successfully installed emissions controls that reduced hazardous air pollutants below certain thresholds.

EPA's proposed fugitive emissions monitoring program does not raise the same anti-backsliding concerns as Section 112 MACT standards, especially at oil and gas well sites, mainly due to the fact that after the first few years, the production declines and the fact that new natural gas sites are subject to stringent controls and standards under NSPS OOOO anyway. The potential reductions that can be achieved by continuing to implement LDAR at these sites will be small and instead the capital and resources can be more efficiently deployed for reductions under the EPA Methane Challenge (ONE Future) program. These facilities could employ a lower frequency monitoring coupled with desk-top estimation. Should these surveys and desk-top analysis show emissions above the threshold, these facilities would require the sources to re-initiate fugitive emissions monitoring and became affected facilities.

RECOMMENDATION 3: EPA SHOULD PERMIT AND ENCOURAGE THE USE OF ALTERNATIVE METHODS OF COMPLIANCE WITH THE PROPOSED OOOOa REQUIREMENTS TO ADDRESS FUGITIVES EMISSIONS.

In the case of fugitive methane emission components at well sites and compressor stations, EPA is acting under its authority under Section 111(h) of the Clean Air Act.[21] Section 111(h) provides authority to the EPA to promulgate a particular work practice standard only if that standard reflects "the best technological system of continuous emission reduction which (taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated)." EPA has proposed a particular leak detection and repair (LDAR) regime as the work practice standard to address fugitive methane emissions at well sites and compressor stations.

EPA's proposed requirements for addressing Fugitive Emissions at Well Sites and Compressor Stations constitute the most significant concern for ONE Future's members in the Proposed Rule, as we view the likely costs associated with these provisions as high, while the emissions reduction benefit is relatively low. We urge the EPA to provide additional flexibility to ONE Future member companies who utilize comparable or superior programs to address fugitive emissions across their assets.

EPA has the authority to allow for alternative means of emission limitation. Section 111(h) of the CAA authorizes EPA to permit the use of an "alternative means of emission limitation" if EPA finds that it will

[21] CAA § 111(h) provides that, if in the judgment of the Administrator, it is not feasible to prescribe or enforce a standard of performance for a source category, he may instead promulgate a "design, equipment, work practice, or operational standard, or combination thereof" that meets the "best technological system of continuous emission reduction" test. For purposes of these comments, references to "work practice standard" also encompass design, equipment, or operational standards, or a combination thereof.

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achieve a reduction in emissions "at least equivalent to the reduction" achieved by the designated work practice.[22] To this end, we welcome that EPA has solicited comment "on criteria we can use to determine whether and under what conditions well sites and other emission sources operating under alternative fugitive monitoring plans can be deemed to be meeting the equivalent of the NSPS standards for well site about fugitive emissions such that we can define those regimes as constituting alternative methods of compliance or otherwise provide appropriate regulatory streamlining."[23]

There are also strong policy rationales for this approach. EPA already has recognized, under its proposed Methane Challenge framework, the ambition of the ONE Future emissions intensity commitments and as noted earlier the Administration will need rely on voluntary programs to meet its 2025 reduction goals. Therefore, it is reasonable for EPA to support programs that are consistent with the comprehensive ONE Future commitment to optimal performance, including LDAR and DI&M programs being implemented as part of ONE Future/Methane Challenge.

Indeed, the use of existing alternative fugitive monitoring programs through approved EPA Methane Challenge programs such as ONE Future would provide strong incentives for operators to seek deeper reduction opportunities than they otherwise would pursue, including through innovative methods not necessarily covered by the prescriptive fugitive emissions standards specified in the Proposed Rule. Furthermore, by greatly reducing some of the paperwork burdens associated with OOOOa compliance, the EPA would allow operators to deploy additional capital toward R&D in emissions abatement. In this way, this approach would be consistent with Congressional intent that Section 111 would promote innovation in abatement technologies and practices.[24]

As explained below, there are a number of currently-existing Alternative Programs that can and should qualify as "alternative methods of compliance" to the LDAR work practice standard. We believe that these alternative approaches will yield greater reductions in emissions at a lower cost.

The proposed OOOOa requirements to address fugitive emissions have numerous deficiencies. The Proposed Rule does not provide an endpoint or off-ramp from mandatory monitoring, nor does it incorporate any existing alternative LDAR programs. At a given site, *any* LDAR program will become less cost-effective over time, as leaks are repaired and production declines. The costs associated with the OOOOa-prescribed LDAR, however, are ongoing, creating unnecessary, ineffective spending that would reduce the ability to apply scarce funds to more meaningful emission detection and reduction projects – which is central to ONE Future's performance-based design.

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[22] CAA § 111(h)(3).
[23] Proposed Rule at 56,596. The preamble also explicitly solicits comments on corporate programs applicable to compressor stations. Proposed Rule at 56,643.
[24] Sierra Club v. Costle, 657 F.2d 326, 348 (D.C. Cir. 1981).

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The Proposed Rule sets forth a prescriptive LDAR program, including initial instrument survey, semi-annual surveys, leaking component/equipment repair deadlines (irrespective of the significance of the leak), and significant recordkeeping and reporting elements. Although this proposal establishes a baseline road map for those implementing a LDAR program for the first time, it penalizes those operators that have been implementing alternative measures for addressing fugitives on a voluntary basis. In addition, the prescriptive nature of the proposed work practice standards do not allow companies to identify or pursue improvements to the rule that may be known now or may become clear over time, such as a different frequency of surveys, alternative instrumentation used in the surveys, or application of future continuous emissions detection system. (Moving to a more data-drive, risk-based approach over time is at the heart of the Directed and Inspection Maintenance Program concept.) Delineating such a prescriptive LDAR program prevents companies from implementing efficiency measures that lower the actual cost of the fugitive emissions control measures – and may often prevent capital expenditure on measures that would prevent future leaks.

Depending on a company's assets and geographic footprint, the inspection and repair schedule that would be imposed by the Proposed Rule on new and modified sources may be draconian, and will divert resources away from more effective efforts to find and fix fugitive emissions elsewhere in their existing assets. Many companies achieve greater cost-efficiency by coordinating Fugitive Emission surveys based on well site and compressor station locations, which significantly reduces travel time and costs, while yielding superior systemic results and awareness. However, as proposed, many companies are confronting the very real prospect that the resources which they would otherwise have dedicated to area-wide fugitive emission reductions will be principally consumed by OOOOa compliance.

The proposed Fugitive Emissions standards will undermine the Administration's Strategy to Reduce Methane Emissions by detracting from more effective reduction efforts being undertaken by ONE Future in conjunction with the Methane Challenge. The industry has already shown significant interest in voluntary programs, as evidence by the strength of ONE Future's membership. Yet as a general rule, most companies will necessarily first obligate their resources and budgets to regulatory compliance (i.e. NSPS OOOOa and OOOO) as opposed to voluntary programs. This means that some companies that would have participated in programs such as ONE Future and Methane Challenge may be deterred. Those who go forward will be challenged to achieve meaningful reductions at the small subset of facilities that are subject to the OOOOa Rule (which should already be performing optimally due to new components and investment), at the expense of deeper reductions that could be achieved through *nationwide* fugitives monitoring and repair programs. As a result, we believe the proposed NSPS fugitive emissions program will have the unintended consequence of undermining the Administration's ambitious methane reduction goals.

In January 2015, the Obama Administration specified an overarching goal of reducing methane emissions from the oil and gas sector by 40 to 45 percent below 2012 levels by the year 2025.[25] Based on our analysis and public statements, we conclude that a reduction goal of 40-45% equates to emission reductions of between 77 and 86 million metric ton of carbon dioxide by 2025[26] – even as the EIA projects that natural gas production will likely grow some 27 percent over that same period.[27] In addition to EPA's Methane Challenge, major components of the Administration's Strategy to Reduce Methane Emissions include the following regulatory actions:

- The OOOOa Rule, which EPA estimates will result in emission reductions equivalent to between 7.7 and 9 million metric tons of carbon dioxide[28];
- EPA's draft Control Techniques Guidelines (CTGs) for reducing VOC emissions from existing equipment and processes in the oil and natural gas industry, which EPA estimates will result in emission reductions equivalent to 5.5 million metric tons of carbon dioxide[29];
- BLM's Venting and Flaring rule, for which no estimates are currently available; and
- PHMSA's future rule for addressing the sector, for which no estimates are currently available.

From these projections, we conclude that a majority of the methane emission reductions associated with meeting the Administration's 40-45% goal are expected to be achieved via voluntary programs such as Methane Challenge. ONE Future has made a commitment to achieve a specific, measurable and ambitious performance target that, if adopted across the industry, would obviate the need for future regulation, while simultaneously improving the reliability of emissions data.

EPA's estimated the potential reductions from application of annual and semi-annual LDAR (as noted in Table 2) and eventually concluded that semi-annual LDAR using Optical Gas Imaging (OGI) technology was the "Best System of Emission Reduction" (BSER) for fugitive emissions at oil and gas facilities. Even with semi-annual LDAR, at best, EPA estimates a reduction of about 5.4 mm tons of methane as CO_2e or roughly 6-7% of the total Administration goal of 77-86 mm tons. In other words, the LDAR element included as part of this Proposed Rule is expected to achieve only a very small portion of the overall of the White House Methane Strategy objective.

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[25] The White House, "FACT SHEET: Administration Takes Steps Forward on Climate Action Plan by Announcing Actions to Cut Methane Emissions" January 15, 2015. Accessed on November 2, 2015 at: https://www.whitehouse.gov/the-press-office/2015/01/14/fact-sheet-administration-takes-steps-forward-climate-action-plan-anno-1

[26] Source: https://www.whitehouse.gov/energy/climate-change ("[A]chieving this goal would save up to 180 billion cubic feet of wasted natural gas in 2025. " Accessed on November 2, 2015. Our calculations indicate that 180 bcf of natural gas is equivalent to approximately 86 million metric tons of CO_2. (Utilizing a Global Warming Potential of 25 and assuming a factor of 19.2 g methane/scf of natural gas.")

[27] U.S. Energy Information Administration, "Annual Energy Outlook 2015", *Table: Natural Gas Supply, Disposition, and Prices.* Accessed on November 2, 2015 at: http://www.eia.gov/beta/aeo/#/?id=13-AEO2015&cases=ref2015

[28] EPA, "Proposed Climate, Air Quality and Permitting Rules for the Oil and Natural Gas Industry: Fact Sheet," August 18, 2015. Accessed on November 2, 2015 at: http://www3.epa.gov/airquality/oilandgas/pdfs/og_fs_081815.pdf.

[29] *Id.*

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Table 2: Emission Reduction Potential by Implementation of EPA LDAR Program[30]

Site Type	2025 Methane Emission Reductions in Tons Per Year (tpy)	
	Annual	Semi-annual
Natural Gas Well Sites	69,710	106,036
Oil Well Sites	43,577	65,365
Gathering & Boosting Stations	21,845	32,767
Transmission Stations	898	1,347
Storage Stations	5,919	8,879
Potential Reduction	141,949	214,394

Create a framework to employ alternative methods of compliance with EPA's Fugitive Emissions standards. Many leading companies, including ONE Future members, have already undertaken significant measures to reduce their methane emissions by via alternative LDAR and DI&M programs. These programs are typically applied across operators US assets and applied to both new and existing facilities. ONE Future companies recognize the importance of commercial performance and efficient deployment of capital and resources to achieve the greatest reductions. Typically, existing facilities have higher emissions than new facilities. New facilities in the natural gas sector are already designed with the newest and most advanced technology.

We urge the EPA to permit and encourage companies to adopt alternative methods of compliance with the OOOOa Fugitive Emissions requirements, as provided for under CAA § 111(h)(3), provided the programs meet the following criteria:

1. The Alternative Fugitive Emissions Monitoring Program ("Alternative Program") is employed under the EPA Methane Challenge's Best Management Practice (BMP) or ONE Future programs thereby ensuring that the program provides ample performance data.
2. The Alternative Program includes a process for conducting leak surveys, identifying leaking components/equipment, and repairing leaking components/equipment.
3. The Alternative Program either takes the form of a Directed Inspection & Maintenance Program (DI&M), or includes recordkeeping and reporting requirements that may be used to assist the firm to develop such a program. A DI&M allows each operator to determine where inspections should take place based on their unique, intimate knowledge of their operating assets. DI&M is a well-established, EPA-recognized tool for detecting, prioritizing and repairing fugitive emissions in a cost-effective manner. It provides operators with the flexibility to utilize the knowledge of their operations to identify the major leaks, which historically have been found to emanate from a small number of sources.

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[30]See Table 5-13 in *Oil and Natural Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution, Background Technical Support Document for the Proposed New Source Performance Standards, 40 CFR Part 60, subpart OOOOa* available in the docket at http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2010-0505-5021.

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4. The Alternative Program includes Audible, Visual, Olfactory leak survey during regular well pad and compressor station facility visits as part of routine operations (i.e., standard operating practices).
5. The Alternative Program includes the use of an optical gas imaging or infrared camera and/similar devices to conduct "instrument" leak detection surveys at well pads and compressor stations.
6. The Alternative Program requires an instrument leak detection survey of new wells and new compressor stations within 180 days of commencing operation. The subsequent survey frequency should not be arbitrarily fixed at a semi-annual basis as noted below.
7. The Alternative Program specifies timelines for when repairs need to be completed and if needed a re-survey.
8. The Alternative Program should specify training requirements and qualifications for employees and contractors as it relates proper operations of the instruments, understanding of the program and process and field training with the use of instruments.

The final rule should establish provisions for companies to submit Alternative Programs that meet the above criteria. The NSPS rules should allow for such "alternative or custom plans." As an example, NSPS Subpart GG requires fuel gas sulfur content monitoring for certain turbines. However, companies may submit a custom plan and request revisions to the frequency of the monitoring and revisions to the monitoring locations. Over time, EPA has approved many custom monitoring plans that removed the monitoring from each turbine location to key locations along the pipeline.

Alternative LDAR or DI&M programs undertaken as part of the EPA Methane Challenge (BMP or ONE Future) are deemed equivalent to the EPA NSPS OOOOa standards and can be employed at any new or modified affected fugitive emissions facility immediately on finalization of the rule. This ensures a streamlined and predictive process for current participants in the ONE Future program. We highly recommend that EPA "jump starts" the process through the Methane Challenge program and that EPA develops a "White Paper" or other provisions to develop template Alternative Programs (e.g. see SWN SMART LDAR Best Practice submitted to ECOS) to incorporate these approval of Alternative Programs currently undertaken by ONE Future members.

Enforcement of the Alternative Program should be limited to affected facilities under the OOOOa Rule. Existing sources that the company monitors employing the Alternative Program should not be subject to any enforcement actions.

EPA should not mandate semi-annual Surveys as BSER for fugitive emissions. The EPA has proposed OGI technology with semiannual survey monitoring as part of the BSER for detecting fugitive methane emissions from new and modified well sites and compressor stations. EPA asserts that "the costs

between annual and semi-annual monitoring are comparable. Because semi-annual monitoring achieves greater emissions reduction, we focus our analysis on the cost based on semiannual monitoring."[31] However, when reviewing the frequencies of LDAR in making its BSER determinations, EPA relied on the quantity of methane emissions reductions (as depicted above in Table 2) and not necessarily the cost-effectiveness ($/ton) as noted below in Table 3 (cost of controls presented below are without incorporating the revenues from gas captured).

Table 3: Cost Effectiveness of Fugitive Emission Reduction Programs in $/ton CH_4 abated

	Single Pollutant		Multi-pollutant		
	Annual	Semi Annual	Annual	Semi Annual	Source[32]
Well Site Weighted Average	$2,475	$2,768	$1,237	$1,384	Table 5-14, 5-15
Compressor Station Weighted Average	$686	$718	$343	$359	Table 5-17, 5-18

The EPA proposed analysis clearly shows that annual LDAR is more cost-effective than semi-annual LDAR. A cost-effectiveness analysis provides a means of evaluating whether one technology or work practice yields reductions relative to resources spent. As noted earlier, one can realize significant cost reductions when adopting a nationwide LDAR program in lieu of EPA mandatory programs, mainly due to economies of scale and avoiding efficiencies by having a single program for operators to adhere to.

Once the initial survey is completed, unless the operator has specific knowledge to indicate otherwise, it should be assumed that the facility is not likely to develop significant fugitive emissions leaks for the next several years and recurrent surveys should not be required, especially since these new facilities will be subject to current NSPS OOOO and OOOOa standards anyway.

The following provides a summary of annual LDAR surveys and measurements of the fugitive component leaks using the HI Flow at 53 midstream compressor stations for 2014 and 2015.

Table 4: LDAR and Hi Flow Measurements at 53 Compressor Stations

	2014	2015
Average (cubic feet per minute (cfm))	1.85	1.14
Median (cfm)	1.16	0.64

[31] Proposed Rule at 56,636.

[32] See Tables 5-14, 5-15, 5-17, and 5-18 in Oil and Natural Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution, Background Technical Support Document for the Proposed New Source Performance Standards, 40 CFR Part 60, subpart OOOOa available in the docket at http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2010-0505-5021.

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This company implements an alternative LDAR program and also takes an additional step to measure the leaks using HiFlow instruments. Leaks that are identified are fixed according to the company's LDAR protocol. The measurements above are on "as found" basis on the leaking components. Comparing the data for 2014 and 2015, this company found a 38% average reduction in total leaks from these 53 compressor stations. This data indicates that once leaks are identified and fixed by a LDAR survey, the leakage rates remain fairly low and it clearly indicates that any frequency more stringent than annual basis is unwarranted.

Rather than mandating a specific frequency, ONE Future believes that operators employing an Alternative Program should be given the freedom to select the sites that should be surveyed based upon their knowledge of the operations and the propensity for particular components to develop significant fugitive emissions leaks. The operator would then re-survey approximately 20% of its affected facilities each year so that each affected facility is re-surveyed once every 5 years, or upon "modification" of the facility. Based upon industry experience with DI&M programs within the midstream, transmission and distribution sectors, we anticipate that associated costs will be significantly lower than the LDAR program surveys and reporting required under the Proposed Rule.

RECOMMENDATION 4: PERMIT ONE FUTURE RECORDKEEPING AND REPORTING AS AN ALTERNATIVE TO THE RECORDKEEPING AND REPORTING REQUIREMENTS IN THE PROPOSED RULE.

The Proposed Rule includes extensive recordkeeping and reporting requirements. EPA has extensive discretion to determine what recordkeeping and reporting requirements are necessary for implementation and enforcement of this type of rule. ONE Future urges EPA to authorize that ONE Future member companies that achieve specified interim targets for their methane emission intensity should have relief many of the paperwork burdens associated with demonstrating their compliance with both the OOOOa standards as well as any future Existing Source Performance Standard for the oil and gas sector.

EPA's own cost/labor estimates associated with the proposed NSPS requirements for industry record keeping and reporting (activities such as writing and submitting the notifications and reports, developing systems for the purpose of processing and maintaining information, and training personnel to be able to respond to the collection of information) indicate an estimated average annual burden of 92,658 labor hours with an annual average cost of $3,163,699.[33] Although some of the data and records are basic, many provisions are purely related to demonstrating compliance. (For example, EPA requires digital photographs of operators physically performing monitoring surveys with embedded latitude and longitude positions). Stated differently, these reporting provisions exist to prove you committed no

[33] See "Oil and Natural Gas Sector: Emission Standards for New and Modified Sources" 80 Fed. Reg. 56,593 (Sep. 18, 2015).

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crime. We believe that this burden should be waived or mitigated for proactive operators who have good track records for compliance and safe operations and who by enrollment in ONE Future have demonstrated their interest in continuous improvement.

RECOMMENDATION 5: RECOGNIZE THAT IMPLEMENTATION OF METHANE CHALLENGE COMMITMENTS COULD OBVIATE THE NEED FOR FUTURE SECTION 111(D) METHANE REGULATION OF EXISTING SOURCES.

According to some observers, EPA's promulgation of Section 111(b) methane standards will trigger an obligation under Section 111(d) to promulgate methane standards for existing sources in the same source category. However, Section 111(d) does not specify a deadline for such a subsequent regulation.

To this end, it is important to recognize that case law makes clear that "an agency has broad discretion to choose how best to marshal its limited resources and personnel to carry out its delegated responsibilities."[34] In the recent case of *WildEarth Guardians v. EPA*, the Court of Appeals for the District of Columbia Circuit ("D.C. Circuit") affirmed EPA's decision not to issue section 111 rules—including both new source rules under section 111(b) and existing source rules under section 111(d)—for methane emissions from coal mines.[35] The D.C. Circuit reasoned that EPA's justification— that EPA was "taking a common-sense, step-by-step approach intended to obtain the most significant greenhouse-gas-emissions reductions through using the most cost-effective measures first"—was a sufficient basis for the court to hold that EPA had not violated its obligations under the Clean Air Act by forgoing regulation.[36]

The commitment being undertaken by ONE Future and other Methane Challenge participants constitutes just such a common-sense approach to achieving significant GHG reductions via the most cost-effective mechanism possible. Therefore, ONE Future urges EPA to recognize publicly that substantial participation of oil and gas companies in the Methane Challenge could result in methane emission reductions in an amount that would obviate the need for additional regulation of methane emissions from the sector. Such recognition would provide current and potential prospective industry partners with assurances that if their proactive investments in emissions abatement measures achieve specified targets, it would obviate the need for future regulation under Section 111(d) of the Clean Air Act.

Accordingly, we urge EPA to explicitly and publically recognize that, consistent with the *WildEarth Guardians* holding, sufficient industry participation and successful implementation of the Methane Challenge will reduce methane emissions from existing sources in the oil and gas sector to such a degree

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[34] *Massachusetts v. EPA*, 549 US 497, 527 (2007).
[35] *WildEarth Guardians v. EPA*, No. 13-1212, 2014 WL 1887372 (D.C. Cir. May 13, 2014).
[36] WildEarth Guardians at 6.

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that agency resources would be better marshalled by regulating other sources of greenhouse gases. In which case, the agency will exercise its discretion to forgo regulation of existing sources of methane under section 111(d).

ONE Future acknowledges that the Agency may wish to maintain maximum flexibility with respect to a future rulemaking. Therefore, we urge EPA to make a Statement of Policy to this effect.

RECOMMENDATION 6: PERMIT METHANE CHALLENGE COMMITMENTS AS ANY ALTERNATIVE METHOD OF COMPLIANCE WITH ANY FUTURE SECTION 111(D) REGULATION.

Individual companies adopting ambitious commitments under the Methane Challenge should have assurances that their efforts will earn regulatory recognition under any future Section 111(d) methane regulation in the event that the total efforts are not sufficient to avoid such regulation. Absent such assurances, companies evaluating participation in the Methane Challenge will consider the risk that they effectively would be penalized for early action, i.e., by making an investment in voluntary action that their competitors have not made *and* then being required to make further investments under a future regulatory program. If not addressed, this risk could dissuade many companies from participating in the Methane Challenge.[37] In other words, if EPA does not provide such assurances, there is a strong risk that EPA will not achieve its objectives for the Methane Challenge.

EPA could provide assurances of regulatory relief to companies participating in the Methane Challenge in a number of ways. For ONE Future, the preferred way would be for EPA to provide assurances that it will propose in any future Section 111(d) methane regulation for the sector that a company's comprehensive implementation of its Methane Challenge commitment will constitute compliance with the requirements under the regulation. Again, we recognize that EPA is unlikely to provide binding assurances that will govern or constrain agency actions in future regulatory programs. However, we nevertheless urge the agency to issue a Statement of Policy outlining these elements, and to make clear that it will include them in any proposal for new regulation of existing sources. EPA could also integrate them into a Memorandum of Understanding with each participating company.

RECOMMENDATION 7: PROVIDE ASSURANCES OF BASELINE PROTECTION FOR METHANE CHALLENGE PARTICIPANTS.

The EPA should ensure that Methane Challenge participants will be recognized – not penalized – for their early voluntary actions. Such recognition could be achieved by providing "baseline protection."

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[37] To be sure, companies have a modest incentive to participate in the Methane Challenge if they have reason to believe that widespread participation in the Methane Challenge will forestall regulation of existing sources. However, this incentive is diminished by a collective action problem: an individual company can only control its own participation, not the participation of other companies. That is why it is important provide benefits of participation that a can company can secure through its own actions alone.

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For example, the baseline year for any future regulatory program for existing sources of methane emissions in the oil and gas sector should be 2012, the benchmark year against which the Obama Administration is measuring the reductions it expects to achieve from its methane program. In any event, the baseline year should be no later than the launch date for the Methane Challenge program. If, for some reason, EPA is compelled to establish a later baseline year, the Agency at least should adjust upward the historic baseline emission levels for companies participating in the Methane Challenge. Such baseline protection is vital to ensure a level playing field between companies participating in the Methane Challenge and companies that do not. Otherwise, Methane Challenge participants will be penalized for their voluntary investments in methane abatement.

Again, such assurances could be provided by means of a Statement of Policy or as part of the Memorandum of Understanding in the Methane Challenge Framework.

This concludes our comments. Should you have any questions, please contact:

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To: Dravis, Samantha[dravis.samantha@epa.gov]
From: Dennis Hedke
Sent: Tue 5/9/2017 12:30:06 AM
Subject: Re: Open letter to Ivanka Trump from Joseph Bast

Dear Samantha,

Following up on our last email exchange, I would like to set up our phone date as soon as possible, so please provide me a couple of your preferred time windows to try to connect.

Thanks and I hope you're having a great week.

Sincerely,

Dennis

On Thu, May 4, 2017 at 1:11 PM, <dhedke@cox.net> wrote:

> Dear Samantha,
>
> I hope this finds you well and enjoying your expanding endeavors at EPA.
>
> In the event you have not seen the article below, appearing in today's American Spectator, I encourage you to take a look at your earliest convenience.
>
> In addition, I humbly suggest that if he is not already doing so, the names that Administrator Pruitt really needs to listen to regarding anything related to Climate issues are people like:
>
> Dr. Willie Soon, Astrophysicist at the Harvard-Smithsonian Center for Astrophysics;
> Dr. Richard Lindzen, Physicist, Massachusetts Institute of Technology;
> Dr. Will Happer, Physicist, Princeton University;
> Dr. John Christy, Alabama State Climatologist, Director of the Earth Science Systems Center (ESSC), University of Alabama-Huntsville; Dr. Roy Spencer, former NASA lead scientist regarding implementation of weather satellite systems, now also at ESSC;
> Dr. Patrick Michaels, former Virginia State Climatologist and Professor of Environmental Science at the University of Virginia, my second alma mater, currently at the Cato Institute;
> J. Dr. Christopher Horner, Attorney, Competitive Enterprise Institute
>
> These men are absolutely stalwarts in advancing fundamental understanding of earth's climate, as well as superb contributors regarding the advancement of appropriate policy related to U.S. and global matters of Environmental Stewardship. I could list many more, but this short list has been invaluable to me for many years.
>
> Thank you and I hope this adds to your perspective related to moving our policy where it desperately needs to go.

Sincerely,

Dennis Hedke
Consulting Geophysicist
Past Chairman, Energy & Environment Committee, Kansas House of Representatives
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From: Joseph Bast <JBast@heartland.org>
Subject: Open letter to Ivanka Trump from Joseph Bast
Date: Thu, 4 May 2017 16:47:52 +0000

American Spectator ran my "open letter to Ivanka Trump" on climate change today. The comments are pretty funny, too.

Joe

https://spectator.org/296756-2/

From the Heartland
Open Letter to Ivanka Trump: Serve Your Father by Relying on Scientists,
Not Celebrities Who Push Climate Calamity
By Joseph L. Bast<https://spectator.org/bio/joseph-l-bast/>
NOTE: The following is a letter Heartland Institute President Joseph Bast sent to Ivanka Trump, top advisor to president Donald Trump. As of today, he has received no response.
Dear Ms. Trump,
Recent news stories report your interest in the climate change issue. I share your deep concern over the future of our planet — it's an unbelievably beautiful and precious thing, something we must cherish and protect for all of Earth's creatures and for future generations.
I am writing to urge you to proceed carefully as you explore this subject, because those who claim climate change requires "immediate action" to reduce greenhouse gas emissions, or even "transforming the world's economic system," have often misrepresented the science and economics of this issue.
My organization, The Heartland Institute<http://heartland.org/>, is a national nonprofit organization that has been making the case for conservative and libertarian ideas since its founding in 1984. Many members of the Trump transition team are familiar with our work on climate change and other topics.
The Heartland Institute is "the world's most prominent think tank supporting skepticism of man-made climate change" (according to The Economist). We have published more books, policy studies, and commentaries on the topic than any other free-market think tank in the world (according to the scientific journal Global Environmental Change). We are one of the top ten free-market think tanks in the world (according to TheBestSchools.org).

The truth is that climate change does not require that we reduce energy consumption or replace fossil fuels with alternative energies.
Your father is right when he questions whether global warming is a genuine "crisis" or a product of hype and exaggeration by various interest groups. He is also right to suggest that the issue is being used to extort money from the United States, handicap American businesses, and undermine our economic growth and prosperity.
Claims That Global Warming Is Already Happening
The popular "evidence" that man-made global warming is already happening and is harmful consists mostly of images of melting ice, heat waves, hurricanes, and rising tides. These images appeared in Al Gore's movie, An Inconvenient Truth, and more recently in Leonardo DiCaprio's movie Before the Flood.
Politicians and celebrities sometimes travel to the Arctic and come back saying they have "seen global warming," that "it is real and already happening." But these images and claims are highly misleading. You can't see man-made climate change. Climate is "average weather" over the course of at least 30 years. Extreme weather is always occurring sometime around the world, and always has and always will.
Observing extreme weather events can't tell us whether the climate is changing, or what might be causing changes in weather or climate. For that, we need to view long-term trends, and even then we need to control for known climate cycles and natural variability.
Simply put, there simply is no hard scientific evidence that potentially harmful warming is happening. Dr. Benjamin Zycher, a scholar at the American Enterprise Institute, wrote in 2014 a short and accurate summary of research on long-term trends in extreme weather:

· There has been no temperature<http://www.drroyspencer.com/latest-global-temperatures/> trend over the last 15 years<http://www.ncdc.noaa.gov/monitoring-references/faq/anomalies.php>, notwithstanding the predictions<http://www.drroyspencer.com/2013/06/still-epic-fail-73-climate-models-vs-measurements-running-5-year-means/> of the models.

· The past two years have set a record for the fewest tornadoes<http://www.norman.noaa.gov/2013/05/low-tornado-numbers-and-low-tornado-deaths-may-2012-april-2013/> ever in a similar period, and there has been no trend<http://www1.ncdc.noaa.gov/pub/data/cmb/images/tornado/clim/EF3-EF5.png> in the frequency of strong (F3 to F5) tornadoes in the United States since 1950.

· The number of wildfires<http://wattsupwiththat.com/2012/06/28/what-global-warming-really-looks-like-michael-oppenheimer-fail/> is in a long-term decline.

· It has been eight years since a Category 3 or higher hurricane landed<http://www1.ncdc.noaa.gov/pub/data/images/2011-Landfalling-Hurricanes-11x17.pdf> on a U.S. coast; that long a period devoid of an intense hurricane landfall has not been observed since 1900. The 2013 Atlantic hurricane season<http://www.nhc.noaa.gov/2013atlan.shtml> was the least active in 40 years, with zero<http://www.accuweather.com/en/weather-news/2013-atlantic-hurricane-season/20467725> major hurricanes.

· There has been no trend<http://sciencepolicy.colorado.edu/admin/publication_files/2012.04.pdf> in the frequency or intensity of tropical cyclones, and tropical cyclone energy<http://policlimate.com/tropical/> is near its lowest level since reliable measurements began by satellite in the 1970s.

· There is no long-term trend in sea-level<http://tidesandcurrents.noaa.gov/sltrends/MSL_global_trendtablefc.html> increases. The record of changes in the size of the Arctic ice cover<http://www.worldclimatereport.com/index.php/2011/03/10/amazing-arctic-reconstructions/> is far more ambiguous than often asserted, because the satellite measurements began at the outset of the warming period from roughly 1980 through 1998.

· The Palmer Drought Severity Index<http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml> shows no trend since 1895. Flooding in the United States over the last century has not been correlated<http://www.tandfonline.com/doi/abs/10.1080/02626667.2011.621895>with increases in greenhouse gas concentrations.

Zycher's summary is supported by the sources he cites as well as four hefty volumes in the Climate Change Reconsidered series produced by the Nongovernmental International Panel on Climate Change (NIPCC<http://www.climatechangereconsidered.org/>) and published by The Heartland Institute. The NIPCC series is credible: It has been cited in more than 100 peer-reviewed articles. The Chinese Academy of Sciences thought so highly of it that it translated the first two volumes into Mandarin Chinese and published a condensed edition<https://www.heartland.org/publications-resources/publications/chinese-translation-of-climate-change-reconsidered> in 2013.

So no, there simply is no hard evidence that man-made climate change is already occurring or that it is bad. You should immediately suspect the credibility (or sincerity) of anyone who claims otherwise. They are using scare tactics to get you to think a certain way.

Appeals to Authority

Those who say global warming is a crisis ask you to believe the opinions of "experts" who, upon closer inspection, are unqualified, speaking outside their areas of expertise, or biased. For example, Al Gore, Leonardo DiCaprio, Bill McKibben, Bill Gates, and Naomi Orestes are not scientists. Senator Gore was flunking undergraduate physics at Harvard when he dropped out of that class.

President Obama's claim in 2014 that "97% of scientists agree: climate change is real, man-made and dangerous" is not supported by any credible survey or science literature review. NASA, on its website, cites four sources for this claim: two are essays written by college students, one literature review by a socialist historian, and the fourth one a literature review by an Australian blogger.

See Why Scientists Disagree about Global Warming<https://www.heartland.org/news-opinion/news/why-scientists-disagree-about-global-warming> for a full critique of each of these sources, and a summary of more reliable surveys and literature reviews that find extensive disagreement. A copy of that book is enclosed.

Alarmists often cite the reports of the United Nations' Intergovernmental Panel on Climate Change (IIPCC), but this is a political, not a scientific, organization. It conducts no original

climate research. Its reports are not subject to traditional peer review, and they have become compilations of anecdotal evidence in support of a pre-ordained conclusion. That is not science. See the Nongovernmental International Panel on Climate Change'stestimony to the British Parliament<http://data.parliament.uk/writtenevidence/WrittenEvidence.svc/EvidenceHtml/4288> critiquing the latest IPCC report.

Finally, those who say global warming is a crisis often claim that those who disagree with them are either "paid shills of the oil industry" or part of a "vast right-wing conspiracy" that puts economic growth and profits ahead of protecting the environment. Both claims are false.

Al Gore created the myth that global warming skeptics are paid by industry to "sow doubt," although he falsely claims it was discovered by a former reporter named Ross Gelbspan. There is no evidence of any "skeptic" ever being paid to lie about climate science or its impacts. See Russell Cook's excellent report on this myth titled Merchants of Smear<https://www.heartland.org/publications-resources/publications/merchants-of-smear>.

Once you look at the underlying science — the same sort of number crunching you would perform for a complicated business transaction — you will discover there is no scientific case for reducing our use of fossil fuels.

The Science, by the Numbers

Here are the key numbers you need to know to understand the climate change issue:

0.04% The concentration of carbon dioxide in the atmosphere, that's about 400 parts per million. In the past century it has only gone up by 0.01 percentage point. Carbon dioxide concentrations have risen and fallen before, in pre-industrial eras, without causing climate to change.

1.0 — 1.5C Climate sensitivity, the change in global temperature likely to result from a doubling of carbon dioxide in the atmosphere from pre-industrial levels. We are already half-way to such a doubling, so the warming in the coming century even assuming the alarmists in the debate are right and are not exaggerating, is likely to be too small be to noticeable against natural climate cycles and variability.

1 — 2 mm The long-term annual rise in sea level, since the end of the last Ice Age, which has not increased in the 21st century. This is too small to merit efforts to slow or stop global warming. Claims that sea level is rising faster are based on cherry-picked data sets and fail to take into account land subsidence in some coastal areas.

0.06C The reduction in global temperature that would be achieved by the year 2100 if the U.S. reduced its emissions by 40%, just six one-hundredths of one degree. This is too little to warrant the enormous cost — trillions of dollars — of replacing fossil fuels with renewable energy.

$3,900 The annual per-family cost of Obama's global warming policies, according to a study<http://www.freerepublic.com/focus/f-news/2237947/posts> by the Massachusetts Institute of Technology.

$27 billon How much federal agencies plan to spend on global warming-related programs in 2017.

What Should We Do?

We should all do our share to protect the environment. But the campaign to reduce energy use or to switch from fossil fuels to solar and wind power is not about protecting the

environment. It's about something else.
Since climate is always changing due to natural causes, we should invest in resiliency (hardening infrastructure) and adaptation. Trying to stop global warming from occurring is not necessary, nor is it the best way to protect the environment.
Climate change is a small and remote threat, at best. We probably cannot slow or stop it even if we try. And the cost of ending our primary reliance on fossil fuels is astronomical.
My organization, The Heartland Institute, recommends<https://www.heartland.org/publications-resources/publications/action-plan-for-president-trump> your father's administration take the following steps regarding climate change:

* Create a President's Council on Climate Change, modeled after the President's Council on Bioethics<https://bioethicsarchive.georgetown.edu/pcbe/reports/past_commissions/> created by President George W. Bush in 2001 (and sunset in 2009), charged with cutting through the politics and bias that infected climate science and policymaking during the Obama administration and advising the President on what policies to repeal and what policies to pursue.
* Withdraw from the United Nations Framework Convention on Climate Change and the more recent Paris Accord and end funding for the United Nations' biased climate change programs, in particular the Intergovernmental Panel on Climate Change (IPCC) and Green Climate Fund.
* Replace EPA<https://www.heartland.org/publications-resources/publications/replacing-the-environmental-protection-agency?source=policybot> with a Committee of the Whole composed of the 50 state environmental quality agencies. Those agencies already have primary responsibility for implementing environmental laws passed by Congress and regulations written by EPA.
* Withdraw and suspend implementation of the Endangerment Finding<https://www.heartland.org/publications-resources/publications/comments-in-response-to-epas-anpr-entitled-regulating-greenhouse-gas-emissions-under-the-clean-air-act> for Greenhouse Gases<https://www.heartland.org/publications-resources/publications/comments-of-the-heartland-institute-in-response-to-proposed-endangerment-and-cause-or-contribute-findings-for-greenhouse-gases> and the Clean Power Plan.

Please don't hesitate to contact me if you have any questions. While not a scientist myself, I have had the privilege of working with the Nongovernmental International Panel on Climate Change (NIPCC), an international team of independent climate scientists whose research supports the various statements made above, and who are willing to pitch in and help your father set a new course for climate policy in the years ahead.
Thank you for your concern and for your openness to differing opinions on this important issue.
Sincerely,

Joseph L. Bast
President

==========

To: Dravis, Samantha[dravis.samantha@epa.gov]
From: Tracy Mehan
Sent: Thur 4/6/2017 7:08:56 PM
Subject: AWWA comment letter on Lead Peer Review Panel
2017 04 05 AWWA Comments on Pb Benchmark .pdf

Samantha,

I thought you might find the attached comment letter of interest.

Thank you.

Tracy

G. Tracy Mehan, III

Executive Director, Government Affairs

American Water Works Association

202-326-6125 (direct)

703-850-9401 (cell)

Attachment

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American Water Works Association
Dedicated to the World's Most Important Resource ®

American Water Works Association

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April 5, 2017

Water Docket
Environmental Protection Agency
Mail code: 2822T
1200 Pennsylvania Ave. NW
Washington, DC 20460

RE: Comments on "*Request for Nominations for Peer Reviewers and for Public Comment on Peer Review Materials to Inform the Derivation of a Water Concentration Value for Lead in Drinking Water*," Docket ID No. EPA–HQ–OW–2016–0686

Dear sir or madam:

The American Water Works Association (AWWA) appreciates the opportunity to comment on the Environmental Protection Agency's Federal Register notice, *Request for Nominations for Peer Reviewers and for Public Comment on Peer Review Materials to Inform the Derivation of a Water Concentration Value for Lead in Drinking Water*.

Expert review

AWWA sought assistance in reviewing the peer review materials. Dr. Douglas Crawford-Brown provided this assistance. Dr. Crawford-Brown's review of the materials to be provided to the peer reviewers by the Agency is attached. **AWWA urges EPA and its contractor, Eastern Research Group, to utilize Dr. Crawford-Brown's review to (1) inform preparation and structure of the peer-review panel process, (2) improve the questions posed to the panel, and (3) inform the peer-review panel discussion and the scope of its recommendations.**

AWWA draws the following recommendations from Dr. Crawford-Brown's review:

1. **The peer-review panel will need to know the specific risk management strategies to be evaluated using model outputs and the analytical strategies into which the model output will be integrated.** The peer-review panel must be provided the National Drinking Water Advisory Council recommendation concerning developing a household action level for lead and asked to specifically evaluate the modelling approaches within the NDWAC

framework, including the NDWAC's recommendations on improving the ability to identify specific individuals and households where removal of lead from water is an effective risk management strategy.

2. **The peer-review panel must be fully informed about the variability of lead exposure through drinking water and the variability in both the form and level of lead present in water as a function of water age, timing of water use, water flow, and other variables**. The panel must evaluate and provide advice to the Agency on the minimum duration of exposure that can be appropriately evaluated using the available modelling approaches.

3. **As currently constructed the EPA allows other exposures to lead to occupy the bulk of the lead risk cup and then assumes that the small incremental changes in lead exposure through water are determining increases in blood lead levels.** To better facilitate effective risk management decisions, the panel should be assisted in evaluating an aggregate lead exposure analysis where the lead in water concentration is fixed at candidate pre-defined levels.

4. **Truncation and correlation of the underlying distributions of model input parameters must be adequately explored by EPA and the peer-review panel.** These considerations will have a large impact on predicted blood lead values at the extremes of the distribution proposed within several of the approaches. In addition, it is unlikely that the model results are adequately robust beyond the 90th percentile blood lead level predictions, and consequently, predictions should be limited accordingly.

NDWAC recommendation

The Agency's Federal Register notice indicates that the purpose of the analytical approaches being reviewed are to support development of a household action level as recommended by the National Drinking Water Advisory Council recommendation.[1] But, the stated objective in "Proposed Modeling Approaches for a Health-Based Benchmark for Lead in Drinking Water" is not consistent with this objective. The objective provided to the peer-review panel reads as follows:

> "The objective of this report is to obtain feedback on various modeling methods that can be used to assess the relationship between constant rate lead exposures

[1] 82 Federal Register 6547

to a representative child and a population of children across different age ranges and BLLs."[2]

AWWA endorsed the recommendations to the EPA by the NDWAC on revision of the current Lead and Copper Rule and recommends:

1. **The panel be explicitly charged with evaluating modeling approaches with the NDWAC use case in mind, and**
2. **The analysis be revised prior to the peer review panel in a manner consistent with the application envisioned by the NDWAC.**

AWWA understands the NDWAC recommendation, to be identifying a level of lead hazard in drinking water that would merit consideration as a likely focal point of lead risk management in a specific home so that risk mitigation can occur in that structure.[3] This decision-making process must be effective in the context of actual lead exposure from water, which is typically seen as being predominately low lead levels with intermittent elevated levels of lead due to stagnation of water in contact with lead or to transport of particulate lead.

In part the household action level was a response to concerns that even when corrosion control is effective, individual homes may experience elevated lead levels that would warrant additional action for the individual home. The NDWAC's use case is markedly different from the approach taken in the materials provided the peer review panel. Also, as recognized by EPA policy guidance it is critical that analysis to support risk management begin and focus on meeting the actual risk management need.[4, 5, 6] As an indication of how critical the actual use case is to this analysis, the panel should be aware that the NDWAC Work Group indicated that if the household action level was less than the community-level action level (90th percentile from tap water sampling being greater than 15 µg/L) then EPA should revisit the proposed construct.[7]

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[2] EPA (2016), Proposed Modeling Approaches for a Health-Based Benchmark for Lead in Drinking Water, p. 8.
[3] EPA (2015), Report of the Lead and Copper Rule Working Group to the National Drinking Water Advisory Council, p.37.
[4] NRC (1983) Risk Assessment in the Federal Government: Managing the Process.
[5] NRC (2009) Science and Decisions.
[6] EPA (2014). Next Generation Risk Assessment: Recent Advances in Molecular, Computational, and Systems Biology, EPA/600/R-14/004
[7] NDWAC (2015). Report of the Lead and Copper Working Group to the National Drinking Water Advisory Council – Final. P.36.

Evaluating model predictions in context of variability of inputs

The current analysis will need to be supplemented to facilitate a credible peer-review. **The information provided to the panel should be expanded to include sensitivity analyses that test the model predictions against varied input data and assumptions.** This will be important for (1) determining which elements of the model are most influential, (2) evaluate confidence in the model predictions given the primary drivers within the model, (3) informing where the inputs to the model need to be refined or outputs constrained, and (4) judging the appropriate application of specific modeling approaches given the embedded biases within the model algorithms.

Variability in the model application comes in several forms. Lead occurs in water at concentrations that are typically low with discrete periods of higher values (e.g., a volume of water that has been resident in contact with lead for an extended period, a release of lead particulate, etc.).[8] Also, the form of lead present in water varies; there is lead in solution, there are bits of mineralized scale that contain lead, and there are amorphous compounds with embedded lead. So not only is the lead reaching the tap arriving at a variable level, but the bioavailability of the lead that is present may not be consistent. This temporal variability is a key consideration for the panel as the available epidemiological and toxicological data for short-term exposures to lead are very limited. The panel charge should be expanded to include providing a recommendation for the minimum appropriate biological averaging period to be used in using the model keeping the intended use of the model in mind.

Clear communication

The lead levels prepared using the modeling approaches presented in the peer review materials are all premised on continuous exposure. Almost all the available data in the United States were obtained by deliberately sampling in a manner that represents higher than typical lead levels. **It is essential that EPA explicitly caution against direct comparison of current compliance monitoring data with these levels.**

Informing the Lead and Copper Rule Revisions

The impetus for discussion of lead in drinking water is revision of the LCR. The LCR is one of the most complex Safe Drinking Water Act regulations. The rule has also led to significant reductions in lead in drinking water. Changes to the rule will have significant consequences for communities across the United States, certainly with respect to costs to homeowners, and it is hoped, additional lead risk reduction. The materials provided to the

[8] Abokifa AA and Pratim Biswas. (2017) Modeling Soluble and Particulate Lead Release into Drinking Water from Full and Partially Replaced Lead Service Lines. Environ. Sci. Technol. 51, 3318–3326. P. 3324.

peer review panel suggest that the Agency's SDWA needs are being overshadowed by other EPA interests. It is essential that the peer review panel focus on the needs of the drinking water program rather than become caught up in preserving the portion of the risk cup "needed" by the air, waste, or toxic substance control programs, or become absorbed in historical intra-agency risk policy traditions.

AWWA recommends that EPA consider a modified approach 3 that models the population considering all routes of exposure (aggregate risk) and then examine what happens to the distribution of blood lead levels when the distribution of occurrence of lead in water is reduced below a series of target levels. This approach will more appropriately inform risk management decision making within the context of the stated purpose of this effort.

Proposed peer review panel members

On March 20, EPA proposed a list of peer review panel members. It appears that many if not most of the proposed panel participants are predisposed to specific positions on the issues before the panel. On previous occasions AWWA has noted that it is appropriate to include members in expert panels when their professional opinions are known, even when they have participated in processes or prepared publications that reflect a prior disposition or bias on key questions before a peer review panel. However, it is typical EPA practice to avoid such biases on important peer review panels.[9]

The proposed panel members are an unusual departure from this historic practice as there are several panel members with published papers articulating science policy positions, well-established advocacy work on lead-risk reduction, papers and editorials that bear on the Agency's lead policy under other EPA programs, as well as individuals with responsibility for regulatory positions at the state and federal level. A significant number of the panel participants have participated in the development, use, and/or scientific review of the underlying models used in current analysis. Such experience is helpful in that these individuals bring an understanding of the strengths and weaknesses of the underlying models in the analysis being reviewed; it is problematic in that they also bring the biases to the current task that are born of years of experience with using the current model in other EPA programs. There is also appears to be an important gap in the composition of the panel in that none of the participants have recognized expertise in physiologically based pharmacokinetic modelling of drinking water exposure.

[9] EPA (2009). Addendum to the EPA's Peer Review Handbook entitled "Appearance of a Lack of Impartiality in External Peer Reviews, p. 2-3.

EPA has not yet prepared a record for this process that illustrates that the panel is indeed balanced. Similarly, EPA has not described how it would manage the panel in a way to achieve a balanced scientific review. **As EPA finalizes the panel AWWA encourages the Agency to ensure that the final panel is indeed balanced and that the process followed by the Agency focuses on the scientific issues before the panel. Given EPA's approach to organizing the panel, AWWA recommends that EPA add Dr. Douglas Crawford-Brown to the panel.** Dr. Crawford-Brown has previously served on several EPA peer-review and Science Advisory Board panels, and as evidenced by the attached analysis has appropriate expertise, and in addition would fill the above-mentioned gap in the composition of the panel. His curriculum vitae is available at https://sites.google.com/site/dougcrawfordbrown/home

AWWA appreciates the opportunity to comment on this important notice. Please feel free to contact myself or Steve Via at AWWA (202-628-8303, svia@awwa.org) if you have any questions regarding these comments.

Respectfully,

G. Tracy Mehan, III
Executive Director of Government Affairs
American Water Works Association

Attachment (1)

cc: Peter Grevatt – USEPA OGWDW
Eric Burneson – USEPA OGWDW
Lisa Christ – USEPA OGWDW
Erik Helm – USEPA OGWDW
Laurie Waite – Eastern Research Group

About AWWA:

AWWA is an international, nonprofit, scientific and educational society dedicated to providing total water solutions assuring the effective management of water. Founding 1881, the Association is the largest organization of water supply professional in the world. Our membership includes nearly 4,000 utilities that supply roughly 80 percent of the nation's drinking water and treat almost half of the nation's wastewater. Our over 50,000 total memberships represent the full spectrum of the water community: public water and wastewater systems, environmental advocates, scientists, academicians, and others who

hold a genuine interest in water, our most important resource. AWWA unites the diverse water community to advance public health, safety, the economy, and the environment.

Analysis of the USEPA Proposed Modeling Approaches for a Health-Based Benchmark for Lead in Drinking Water

Prepared by

Prof Douglas Crawford-Brown
Cambridge Science and Policy Consulting
Cambridge UK and Santa Barbara CA

Prepared for

American Water Works Association
1300 I Street NW, Suite 701W
Washington, DC 20005

Submitted:

March 31, 2017

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Executive Summary
Analysis of the USEPA Proposed Modeling Approaches for a Health-Based Benchmark for Lead in Drinking Water

Prof Douglas Crawford-Brown
Cambridge Science and Policy Consulting
Cambridge UK and Santa Barbara CA

The report prepared contains a wide array of considerations in assessing the EPA instructions to the Pb Approaches panel. Here, I rank these from most to least important.

1. I believe the most important issue to the people who must make measurements of Pb in water is the issue of the biological averaging time for effects. Almost nothing is known of the appropriate biological averaging time when it comes to Pb impacts on IQ and clinical measures. But the sampling regime at the moment relies on spot samples, and comparing these spot samples against some requirement on limiting Pb in water. There is a danger that the EPA will continue with this sampling regime and then try to apply the new health benchmark in reducing the concentration that counts as an 'exceedance.' This would be entirely inappropriate as there is no evidence that short term exposures to Pb in water lead to the adverse outcomes mentioned in the EPA health effects document. The issue becomes acute when one considers temporary mobilization of Pb in pipes, leading to very short-term high exposures.

2. The next most important issue is the revised version of Approach 3 required to make the analysis informative for public health risk mitigation. The currently suggested approach by the EPA is to develop a probability distribution for the impact of different water Pb levels on the BLL values in a population. They should instead model the population taking into account all routes of exposure (aggregate risk) and then examine what happens to the distribution when all water supplies are brought into 'compliance' (I realize this is not the correct term for a health benchmark study). The same should be done for the other routes of exposure. This modified form of sensitivity analysis would allow them to calculate the public health benefit of reducing Pb in water compared against reducing Pb by other exposure routes. Such an approach allows calculation of the relative effectiveness of removing Pb from the different exposure routes.

3. Related to item 2 above is my assessment that Approaches 1 and 2 are inadequate bases for establishing a robust approach to risk management. As described in my report, part of the problem is the confusion at the heart of the EPA document in describing these two approaches as reflecting individual, probabilistic risk (they do not) and then compounding this with incorrect use of terms such as 'probability'

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and 'mean' for what are essentially population-level characteristics. Approach 1 is particularly nonsensical, as it asks for the 'probability' that an individual has an Elevated BLL as a result of water intakes. Any water intake will elevate the BLL, even if only by a small and perhaps insignificant amount. So this 'probability' will always be 100%. Perhaps the EPA meant to say something like 'Excessive BLL that has health significance' referring to the 3.5 and 5 µg/dL numbers described in item 4 below?

4. Approach 3 is the only one that meets modern, probabilistic and aggregate exposure scientific standards. Approaches 1 and 2 ignore these advances in the science, including the advances outlined under the EPA's own NEXGEN program.

5. Next is the issue of justifying the proposed BLL values to be examined in the different approaches. These are given at different points in the document as 0.5, 1, 3 (I suspect this may be a typographical error in the document), 3.5 or 5 µg/dL. The EPA appears to have deliberately separated the specification of these target BLL values from the review by the Approaches panel. While the IEUBK assessment does not depend on the target BLL value assumed, the Approaches very much depend on specifying and justifying this target. In particular, there is a problem that the BLL-response curve has a different slope at low and high BLL values, declining significantly at 10 µg/dL and higher. This feature of the curve does not appear to be reflected in the charge to the panel. This will have implications for any approach that looks at aggregate risk, because the impacts on IQ from waterborne Pb will depend critically on the 'baseline' exposures by the other routes.

6. Next is the issue of truncation and correlation in the underlying distributions of parameters in the model. At present, neither of these issues is explored adequately. However, they have profound influences on the BLL values at the 95th and 97.5th percentiles, which is where the EPA is suggesting the panel examine the model output. As shown in their own document, the distributions become very steep (almost vertical) at these percentiles, meaning any small error due to unrecognized truncation and/or correlation will cause large errors in the estimate of BLL values at these percentiles. The panel must be given the charge to examine this issue and its implications for selecting an appropriate percentile that can be reliably determined.

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Analysis of the USEPA Proposed Modeling Approaches for a Health-Based Benchmark for Lead in Drinking Water

Prof Douglas Crawford-Brown
Cambridge Science and Policy Consulting
Cambridge UK and Santa Barbara CA

The following report is divided into three sections:

- Part I contains an overview of the EPA report, highlighting issues of reasoning, strengths and weaknesses as a basis for establishing a benchmark
- Part II contains suggestions for revisions or improvements in the scientific base of the EPA report
- Part III contains draft responses to five areas of the charge questions specified by the EPA in reviews of their report, including recommendations for improvements in the charge questions

Part I: Overview

The structure of this assessment follows that of the EPA report to allow for ease of locating (within the EPA report) the points raised here.

I.0. Executive Summary

There are no issues raised in the Summary that are not raised in the sections on which it depends. Therefore, the Summary is not reviewed separately here.

I.1. Introduction

The Introduction provides a review of the past regulatory actions on Pb in water, and the role of a potential benchmark in moving beyond an Action Level to a health-based indicator.

There is some merit in reconsidering the terminology of a 'health-based benchmark'. The Introduction suggests that the role of the benchmark in setting an exposure limit is not yet certain within the Agency. However, a benchmark' is easily interpreted as – or perhaps confused as – a benchmark dose. In regulatory parlance, the benchmark dose is the first step towards establishing an exposure or dose limit, with uncertainty factors then applied to the benchmark dose to produce a level of exposure considered safe against potential adverse health effects with a margin of safety. Given this past use of the term 'benchmark', there is a reasonable chance that pressure will be brought to bear on the EPA to treat the 'health-based benchmark' in the same way as previous uses of the term 'benchmark'.

A benchmark however is normally part of a process that reduces or removes the need to apply the full suite of uncertainty factors, and certainly those associated with extrapolation from

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LOAELs to a standard. The Agency should raise this issue both in the current report and in the charge to the panel. Further guidance will be needed on the part of the Agency to define what it sees as the role of a benchmark in establishing regulatory limits, and the formal process (including treatment of uncertainty factors) by which it intends to apply the benchmark in practice both in the Lead and Copper Rule and elsewhere. Absent such a discussion, there is potential for the benchmark to 'carry along with it' treatment of uncertainty and conservatism introduced during past practices which were not based on a benchmark.

It is insufficient to simply state, as is the case in the present report, that the Agency is not yet settled on how the benchmark will be applied in regulatory decisions. There are scientifically valid and invalid applications of the benchmark, and so the panel cannot be expected to make blanket statements about the validity of the approaches considered. The panel must address this issue, assessing the scientific basis for application of a benchmark in specific and well defined scenarios of regulatory risk assessment and policy decisions. This question is considered further in Part III.

The Introduction fails to place water exposures into the context of aggregate risk for Pb. This is despite significant advances in both aggregate and cumulative risk assessment over the past 20 years. These advances allow scientifically valid approaches to risk management that consider all routes of exposure simultaneously for a distribution of individuals in a population; to identify the primary routes of exposure for specific subpopulations; and to focus public health resources onto those routes contributing most significantly to public health risk in each subpopulation.

The concept of a 'risk cup' was introduced in part to address the issue of aggregate risk. However the underlying scientific rationale did not always migrate into policy assessments. Rather than use the concept in the way described in the previous paragraph, there has been an unfortunate tendency to calculate the 'risk cup' and then ask the following question: *what concentration of the risk agent in a specific single medium such as water would be sufficient to push the aggregate risk over the lip of the cup*? This is not in the spirit of the scientific approach to risk assessment and risk management described in the previous paragraph. Given that the development of a health benchmark is a step forward scientifically in the regulation of Pb exposures, the opportunity should not be missed to also advance the application of the concept of a risk cup. Otherwise, water will become the default exposure route for risk mitigation, focusing regulatory resources inappropriately in many circumstances and subpopulations.

For some subpopulations using old lead pipes, water exposures may dominate intake of Pb. However, for most populations, water is a secondary or even tertiary exposure route. The situation is therefore similar to other regulatory attempts that focus on water exposure as a means to reduce aggregate risks that are dominated by other exposure pathways. The focus on water in the current Pb document stems from a focus on risk assessment rather than risk management. The Introduction should include at least some discussion of the role of a water benchmark within the larger context of managing exposures to Pb through the environment

(including air, soil and building surfaces) and food. This is especially important because individuals with high Pb content in water are also more likely (than the general population) to be exposed to lead through aging paints in the home or in the soil. Potential exposure routes that must be considered in a reasoned approach to risk mitigation should include inhalation and ingestion with respect to:

- Ambient air
- Indoor air
- Ingestion of deposited Pb resulting from soil/dust concentrations on outdoor surfaces after deposition from ambient air
- Ingestion of deposited Pb resulting from soil/dust concentrations on indoor surfaces after deposition from ambient air penetration into homes
- Ingestion of deposited Pb resulting from soil/dust concentrations on indoor surfaces after deposition from indoor air sources
- Ingestion of Pb paint in outdoor soil
- Ingestion of Pb paint on surfaces indoors
- Ingestion of Pb from premise plumbing (as distinct from the following bullet)
- Ingestion of Pb from drinking water service lines
- Ingestion of Pb in the diet

The section then ends with a description of the three general approaches being considered to establishing a benchmark:

1. The level of lead in drinking water that results in an individual infant or child's probability of an Elevated Blood Lead Level (EBLL) being increased by 1 or 5 percent.
2. The level of lead in drinking water that results in an individual infant or child's BLL increasing by 0.5 or 1 μg/dL.
3. The level of lead in drinking water that results in the 95th or 97.5th percentile of predicted BLLs in the U.S. population of infants or children being equal to 3.5 or 5 μg/dL.

A critique of these three approaches is in later sections of this analysis. All that will be mentioned here is that there is ambiguity as to the 'baseline' exposures against which the increases in BLL are to be assessed. Throughout the EPA Pb report, there is an implicit assumption that exposures to Pb in water are in the part of the BLL-effects curve that is linear, so that the change in IQ points is independent of non-water exposures (see the red box in the following figure). No justification is given for this assumption being valid for all subpopulations, many of whom will have significant exposures from non-water routes, and so there is merit in considering the issue further in later sections of the current paper and in the panel review. This

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is in contrast to the exposure-response data of papers such as that by Lanphear et al[10], which shows a plateau in the exposure-response curve; see the figure below based on those data.

Figure 1. Exposure-response data of Lanphear et al (footnote 1), the primary dataset used by EPA for modelling. The red box shows the region of BLL (all exposure pathways combined) for which the assumption of linearity is valid.

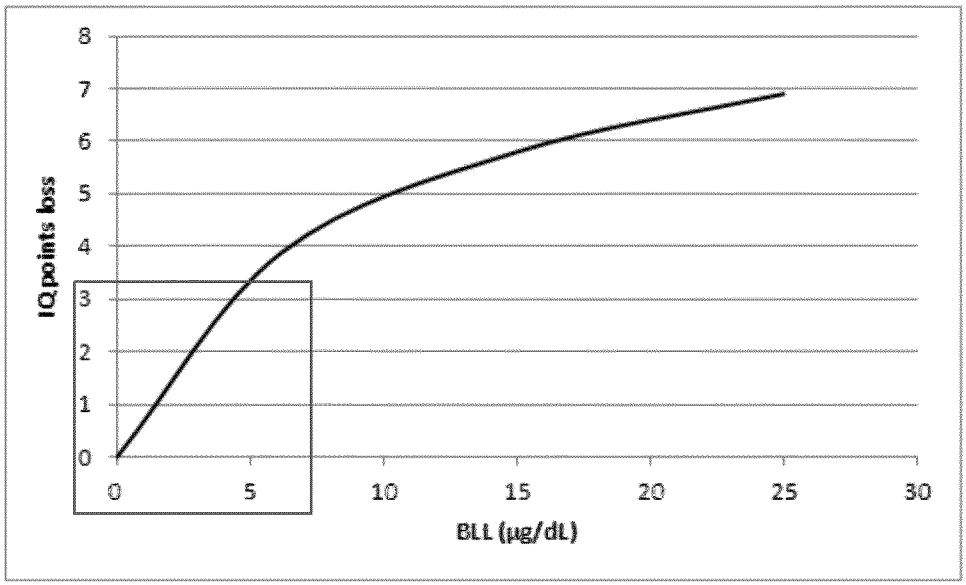

Figure 1 is especially important in the context of a risk cup. Note that the exposure-response curve has a distinct lower slope at BLL values above the red box. This suggests that there is an increasingly marginal return on risk mitigation in subpopulations for whom exposures to Pb by routes other than water place individuals at high values of BLL even before Pb in water is considered. Again, the panel must address this issue, since it suggests there is no single and unique concentration of Pb in water that prevents the 'risk cup' from overflowing, despite this being the wording of the current charge to the panel.

I.2. Background on Lead Exposure and Associated Adverse Health Effects

This section of the EPA report has little to comment on. The discussion is quite cursory, with a simple listing of exposure routes and health effects. With respect to the exposure pathways, no attempt is made in this section to place water exposures into the context of aggregate exposure, with no quantification of the relative values of the different exposure routes. That is presumably because these relative values are discussed in more detail in the Stochastic Human Exposure materials. Still, the section is referred to as 'human exposure to lead', and so the

[10] Lanphear, B., Hornung, R., Khoury, J., Yolton, K., Baghurst, P., Bellinger, D., Canfield, R., Dietrich, K., Bornschein, R., Greene, T., Rothenberg, S., Needleman, H., Schnaas, L., Wasserman, G., Graziano, J. and Roberts, R. 2005. Low-Level environmental lead exposure and children's intellectual function: An international pooled analysis. Environmental Health Perspectives, 113, 894-899

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exposures through non-water routes deserve greater consideration so the reader can understand the issue of risk mitigation within the context of aggregate exposures.

The health effects summary contains most of the relevant effects and studies. However, almost no attention is paid to summarising the strengths, limitations and weaknesses of these studies as a clinical and epidemiological basis for a health benchmark. This may be because the EPA has summarised these data in other documents with a more direct health focus, such as the *Integrated Science Assessment for Lead* (2015) and the authors did not consider it necessary to provide caveats in the current report. However, this leaves the reader with the impression that the clinical and epidemiological data have no significant sources of uncertainty.

There also is no discussion of the issue raised in Figure 1 as to a declining slope to the exposure-response curve. This declining slope has implications for risk mitigation efforts within the context of aggregate exposure. Both the EPA Pb report and the panel charge should include discussion of this issue, with identification of subpopulations and scenarios for which aggregate exposures are likely to produce BLLs within the red box of Figure 1, and those for which the BLLs are likely to be significantly outside that box.

Finally, consider the major places in the assessment being developed by the EPA and on which the panel will be consulted, at which assumptions are weakest due to a lack of data and/or validated models. The primary weaknesses are:

- The epidemiological data do not characterize effects caused by short term exposures that might occur during remobilization of Pb in premise plumbing and service lines. Therefore, it is not possible at present to specify the biologically appropriate averaging time for the effects when these occur through water. This is a critically important issue because there can be very high temporal variability in Pb concentration at the tap, with short periods of elevated exposure. The current Lead and Copper Rule specifies a sampling protocol that captures these elevated periods of exposure, with advisory levels being linked to these high but usually short term values. By contrast, the panel is being asked to consider a water concentration that poses a 'significant risk', with no further guidance as to the treatment of temporal variation. Absent such a treatment, there is a danger that the Lead and Copper Rule approach to sampling to identify periods of high but potentially brief concentrations will then be applied to any health-based benchmark considered by the panel or developed by the EPA. *The panel must be given a clear charge to consider temporal variability in their analysis; the approaches and scenarios considered by them must include this variability; and a statement will be needed as to how the lack of data on temporal variability in the epidemiological studies is addressed.*

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- There remains essentially no data on the effect of small amounts of IQ loss on clinical measure of health and well-being. For most BLLs being considered, the IQ loss is less than 1 point (although it becomes several points at exposures approaching and above 10 µg/dL). *Some statement is needed from the panel as to why such a small loss – if it exists – is considered clinically adverse as a focus of risk mitigation.*

- The studies contain several limitations that broaden uncertainty bounds and weaken the statistical significance of conclusions[11] (although these are in part addressed through use of meta-analyses): uncontrolled variables leading to potential confounding; poor measurement of parental IQ; selection bias in the reporting of results when multiple analyses are performed; and lack of quality control in IQ measurements.

1.3. Overview of the Integrated Exposure Uptake and Biokinetic Model

The description of the IEUBK is similarly cursory, although again this is likely to be because the EPA considers earlier documents to have provided sufficient materials for consideration by readers of the scientific basis. However, this model has now received extensive review. The EPA has made advances in the probabilistic aspects of the model, with almost 100 variables now being controllable by the user. While the primary output is a geometric mean of the BLL (µg/dL) for a group of children aged 6 to 84 months and for a given exposure scenario, the model also produces a probability density function that allows for estimation of the probability a BLL in excess of any specified value such as that which might be established under the proposed benchmark.

The challenge to the model remains that the measure of performance of the model focuses on agreement between the model and databases such as NHANES with respect to the median BLL for a population. It does not focus on agreement or disagreement in the tails of the distribution of BLLs, despite these tails playing such a significant role in the approaches to be considered by the review panel. *The panel must therefore extend its assessment of the model out into the tails of the distribution, up to at least the 95th percentile as discussed later.*

There is an additional challenge to comparisons between the model and the databases. Consider two individuals with identical rates of intake into the body. The first individual clears Pb from the central or transfer compartment at the average value for the rate constant used in the model; the second clears the Pb at a significantly slower rate due to metabolic and physiological differences from the general population. In the latter case, the small (atypical) clearance rate indicates that the Pb may not be transferring to the critical organs such as the

[11] Kaufman, A. 2001.Do low levels of lead produce IQ loss in children? A careful examination of the literature. Archives of Clinical Neuropsychology, 16, 303–341

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brain as effectively as in the average individual considered in the model and in comparisons against the databases. For this 'slow clearance' individual, the same intake rate as in the first (typical) individual will produce significantly higher values of the BLL in the second individual, since the Pb remains in the plasma rather than entering the tissues. A 'high BLL' individual in a database, and in clinical or epidemiological studies, may therefore represent either a high exposure/intake individual, or an individual with low clearance rates from the central or transfer compartment. This issue is not explored adequately in either the current EPA Pb report or the past reports on the IEUBK, but deserves greater consideration in future research to separate out individuals with high BLLs caused by these two possibilities, as the implications of a high BLL will differ in these two groups.

I.4. Overview of Stochastic Human Exposure and Dose Simulation Model

The SHEDS model has been applied repeatedly in regulatory risk assessments, and remains the EPA's best model for stochastic exposures within the context of aggregate exposure. As in the previous two sections, it is not possible in the current EPA report to understand the basis, strengths, limitations and weaknesses of SHEDS, but these have been covered in earlier reports by the EPA. The use of the time-activity diaries from NHANES and CHAD is a strong feature of SHEDS, although it is not evident that such detailed time series data are important in the context of Pb exposures given the comment earlier that the health impact of short-term exposures to Pb are not well characterized in the clinical and epidemiological data. Where the effects data cannot be related to short term exposures, the use of time-averaged values of intake over several weeks or months will be sufficient, lessening the utility of the time series data since the exposures to an individual will 'average out' over time.

In addition, the SHEDS model does not adequately represent the diverse sources of water consumed by a given individual.

In addition, there remains ambiguity within the model as to how to treat inter-subject variability in intakes by the different routes, especially when one considers diverse diets for food. Here there are two 'bracketing' possibilities:

- A given individual is always at a given population percentile of intake by a given food category, so the intake is constant in time (albeit elevated or reduced relative to the population average). Therefore a 'high exposure' individual remains in the upper tails of the underlying probability density function for each day of exposure.

- An individual varies their diet day-to-day, with a changing mixture of intakes of food, water, soil etc. This causes an averaging of their weekly or monthly intake of Pb, moving that average towards the population mean.

The use of the time-activity diaries allows consideration of this issue, but the current EPA report does not specify which of these assumptions will be used and in which circumstances. That can

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be easily resolved by specifying this consideration further before application of SHEDS. Both bullets above are present in individuals, with their exposures being a combination of the two. However, SHEDS does not contain sufficient detail to allow for such a combination. *The most scientifically valid approach is the second bullet, and so the review panel should consider how lack of ability to model this exposure profile within SHEDS affects results in the tails of the probability density function that is used in several of the approaches outlined by the EPA in the Pb report.*

I.5. Inputs Used to Conduct Analyses

The EPA has chosen to rely firstly on the input parameters from the IEUBK and SHEDS models, except where the scenarios to be explored require supplementary or different values. These differences are summarized in Exhibits 13-20 of the EPA report for the different exposure scenarios.

There are many different databases that could have been used for these input parameters. The EPA has selected reasonable ones, and in any event the default values have been peer reviewed in past applications of at least SHEDS (less so for IEUBK).

The current author has examined the databases cited by the EPA in their report, and the numerical values in the various tables of this section appear reasonable. The exception to this is Exhibit 4 concerning time spent indoors. The table shows a GSD (Geometric Standard Deviation) of between 10 and 14. Given the Geometric Means reported, this suggests individuals spending significantly more than 24 hours indoors on a day, an impossibility. This table should be re-examined by the authors of the EPA report.

This leads to a broader issue, that of truncation. The choice to use lognormal distributions for most parameters is scientifically valid, and the GM and GSD values are reasonable as well (with the one caveat above). However, lognormal distributions of most parameters are truncated in reality as well as in risk assessment practice. It is not evident that any truncation has taken place in this EPA document, or is recommended. Again, this may be because truncation is considered in some of the earlier supporting documents, but it should be mentioned here as well because it so strongly affects results at the upper percentiles that will be considered in establishing a benchmark; specifically, improper application of truncation will cause the upper percentiles of the BLL in a population (such as the 95th or 97.5^{th}) to be artificially high.

There also is no description of how correlation of parameter values is to be included. Again, these correlations are to some extent built into the SHEDS and IEUBK models, but that correlation is broken when one considers the non-default values used in Exhibits 13 through 20. Clarity is needed on this issue, for the same reasons given in the previous paragraph.

At the start of Section 5.11, the EPA authors mention use of a GSD of 1.6 for the IEUBK model and for most environmental assessments in general. It is not clear how this comports with the

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various GSDs given for the different parameter values in earlier parts of this section. Is the GSD of 1.6 meant to be applied uniformly to estimates of BLL values resulting from the IEUK under a given exposure scenario? If not, what is the purpose of this opening paragraph? If yes, a value of 1.6 does not compare well with the compounded GSD one would calculate using the GSDs of the various parameters in the Exhibits and text of Section 5. Clarity is needed on this issue.

I.6. Potential Approaches for Modeling Lead in Drinking Water Based on High Lead Exposure Scenarios

The EPA has chosen to consider three potential approaches. All use the IEUBK model in some form. The first two use the IEUBK model directly by estimating the BLL for an individual. The third uses the SHEDS model as well. Rather than linking the SHEDS and IEUBK models in the third approach, the EPA has chosen to develop a regression equation (between Pb uptake and BLL) rather than running the full IEUBK model for each SHEDS sampling of individuals. This approach should not produce significant errors in estimating median or mean BLLs for a population, but may produce significant errors when applied to individuals in the upper tails of the distribution of exposures and BLLs. This issue is raised again in Section III of the present analysis.

Approaches 1 and 2 use a baseline distribution of BLLs in the unexposed population and then ask two questions: "what concentration of lead in drinking water changes the probability of an EBLL by a defined percentage?" (Approach 1) and what "concentration of lead in drinking water…shifts the geometric mean blood lead level by a defined amount?" (Approach 2). Approach 1 is much more heavily affected by the treatment of truncation and correlation mentioned earlier (i.e. the answer obtained to the charge question can be a significantly reduced concentration compared to the answer if truncation and correlation are considered), and so these issues must be resolved for at least this approach. The issues are significantly less important quantitatively for Approach 2. In both approaches, the shift in the BLL (from the assumed baseline BLL) is calculated assuming only exposure to Pb in water.

The methodology for calculating the shift in percentage of individuals with an EBLL (taken as 3.5 and 5 µg/dL in separate calculations) is sound, given the assumptions of the previous sections of the EPA report. However, no justification is given for the selection of a 1% and 5% shift as being a reasonable basis for public health concern. This does not mean a justification could not be developed; just that no justification is provided. Perhaps the justification is a reference to a Benchmark Dose concept in other areas of environmental exposure-response, where a 1%, 5% or 10% increase in effects is taken as the point of departure, but this is not stated.

The lack of a clear statement of the justification prevents the reader - and ultimately the review panel – from considering the applications of the methodology that will be scientifically valid and an effective means of rick mitigation. *Both the EPA Pb report and the charge to the panel should include such a clear statement; the panel should be charged with providing a clear statement as*

to the applications for which the various proposed percentage increases in BLL are valid as a basis for risk assessment and risk mitigation.

Exhibits 21 through 27 of the EPA Pb report display the calculated Pb concentration in water corresponding to a 1% and 5% shift under different background levels of soil/dust. Again, the methodology proposed is reasonable. It is not clear in the EPA report, however, why soil/dust was singled out in these exhibits as the baseline exposures for these approaches, especially given that food is considered in the modelling approaches proposed and is known to be an important route of exposure. It may be that the Air Office of the EPA has expressed a particular interest in this issue, but that is not a proper scientific reason for the left-most columns in these tables to include only this route. The same can be said for exposures to Pb through ingestion of paint on surfaces of a building, although to a lesser extent. *The baseline exposures in the left-most columns of the exhibits should include all of the non-water routes of exposure that eventually are included in the calculations of BLL, and the panel should be charged with considering all such routes.*

Similar comments to the above apply to the Exhibits associated with Approach 2.

The section of the EPA report concerning uncertainty and limitations is cursory and makes no attempt to quantify that uncertainty or to explore the implications of errors introduced by uncertainty for risk assessment and the ability to answer the charge questions under the three proposed approaches. The EPA should consider at least the order of magnitude of this uncertainty, and the review panel should be charged with considering the potential impact of errors introduced by this uncertainty on the reliability of the answers they provide under three proposed approaches. *The latter consideration is especially important for those approaches that rely on estimates in the upper tails of the distribution of BLL, as the tails are most heavily influenced by small errors*.

Approach 3 comports most closely to other areas of probabilistic risk assessment by the EPA. The proposed methodology, including the development of the regression equations from IEUBK, is scientifically sound, or at least common in risk assessment practice. It is also the methodology for which treatment of correlation and truncation will be essential and can greatly skew results if done poorly. Again, it is not clear how the proposed methodology incorporates these, although there is nothing in the methodology that would prevent them from being treated rigorously.

It is not clear in this section how food exposures are treated within the analysis. The wording of the document (associated with the exhibits mentioned previously) appears to suggest that the only non-water exposures included in the baseline BLL are by air/dust. This is despite the fact that food exposures clearly are considered in the modeling to support the three approaches. It is likely that the authors of the Pb report have worded the issue poorly, and that all exposure routes are in fact being considered in all three approaches. If this is not the case, and if

Approaches 1 and 2 do not consider non-water exposures other than to air/dust, justification is needed and the review panel should be charged with considering the validity of this justification both for risk assessment and for policy decisions.

How would one interpret the regulatory significance of findings in Approach 3 that non-water exposures already push individuals above the EBLL value (a form of 'risk cup' analysis)? One interpretation is that water must be controlled at zero. However, that ignores the fact that even such stringent control on waterborne exposures will not keep the upper percentiles of the population below the EBLL threshold. This is additional reason for arguing that the EPA should turn to a risk mitigation approach in which the different exposure pathways are compared so the most significant exposure pathways receive the greatest attention. If instead a Relative Source Contribution approach is used, as is common practice, an incorrect level of attention on Pb in water will emerge, with the least significant pathway (water) receiving the greatest regulatory attention.

This section of the EPA report mentions the issue of time averaging described earlier in the current paper. It does not however describe how this issue will be resolved, given the use of the time activity data in SHEDS. Resolution of this issue is needed to place the analysis on a sound scientific basis. This will require specification of an appropriate biological averaging time, and sampling from SHEDS that averages over this time period.

I.7. Conclusions

Exhibits 41 through 43 summarize the findings of the earlier sections for the three approaches and for different EBLL values. The EPA does not attempt to select one approach over the others in this document. However as described earlier in the current paper, Approach 3 comes closest to the more scientifically rigorous probabilistic risk assessment methodology, and so is preferred by the current author (note: this is not an AWWA position, but solely that of the author).

Results in those Exhibits include values at the 97.5th percentile. Given the significant issues of correlation and truncation, the current reviewer does not believe results can be produced reliably at such a high percentile. Even the 95th percentile is questionable until the truncation and correlation issues are resolved adequately. As one moves closer to the 50th percentile, the issue become less significant and the results more reliable.

I.A. Potential Values of Lead Modeling in Drinking Water Based on High Lead Exposure Scenarios

Appendix A gives the results of analyses for formula feed infants, and with household paint exposures. The methodology is the same as that used in Approaches 1 and 2, and so is as valid as, and as limited by, the considerations in earlier sections of the current report.

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It is not clear why Approach 3 has been left out of this analysis. It may be because the EPA believes that infant formula and Pb paint exposures are already included in the SHEDS model underlying Approach 3, and so a separate modeling exercise is not required. If this is the explanation, this should be described in the report, with some indication of where in the percentiles of BLL individuals with these characteristics (infant formula and Pb paint) fall in the population distribution. This is necessary to determine the contributions of these two pathways to total BLL as used in Approach 3.

I. B. Additional Information from SHEDS-IEUBK Analysis

Exhibits 55 and 56 appear on the surface to contradict an earlier assumption of the current author that food exposures were not being included in the three Approaches. If they were not included, they would not appear in these histograms. This issue must be explained better in the earlier sections of the EPA report.

Finally, note that in Exhibit 54 the slopes of the cumulative distribution functions are very steep out at the 95th percentile and beyond. This means that very small errors in the distributions due to the truncation and correlation issues mentioned previously, as well as a failure of lognormality in the tails, can introduce large errors in the estimate of the associated BLL. *This further calls for the use of a percentile of less than 95%; the review panel should be charged with recommending a reasonable percentile that can be estimated reliably.*

Part II. Revisions or improvements

These follow from the analyses in Part I. They are summarized here as the key recommendations to improve the scientific validity of the approaches. They focus on recommended or potential improvements to the proposed methodologies. Implications for improvements to the charge questions – stemming from the need to formulate the charge questions to address the potential improvements to the methodologies – are found in Part III.

1. ***Clinically adverse effect level, or probability of effect?*** The proposed methodologies are a curious hybrid of the approaches taken to cancer and non-cancer effects within EPA regulatory practice. To harmonize the Pb regulatory health risk process with that of other compounds, it would be useful to either formulate a level of IQ decrement that is considered clinically adverse, and/or calculate a probability that an individual experiences this level of decrement from intake of drinking water. There are scientifically agreed 'IQ bands' used in psychology (extremely low, average, superior etc.), each characterized by approximately 10 IQ points in width. These bands represent IQ values that are roughly similar with respect to clinical and educational characteristics that are correlated with an individual's welfare. *The scientific basis of any proposed health-*

based standard based on BLL should be improved through better understanding of the likelihood that an individual is moved between bands as a result of exposure to Pb in each exposure pathway.

2. ***BLL or tissue dose?*** The current proposed methodologies all focus on BLL as the risk metric. However adverse effects associated with Pb intakes are due not to the BLL but rather to the tissue dose (especially to brain and/or nerve tissue) delivered by this BLL. Greater clarity is needed on the relationship between BLL and tissue dose. It should be recognized that a high BLL could indicate any of three factors at play: (i) the individual had a higher than average intake of Pb, (ii) the individual had a slower than average clearance rate constant from the body (by excretion) and/or (iii) the individual had a less effective transfer fraction from the plasma/transfer compartment into the tissue. All of these will produce a higher than average BLL, but only the first two suggest the high BLL might be associated with a higher than average tissue dose. The third explanation would result in a lower ratio of tissue dose to BLL. More study is needed of the relative roles of these factors in causing a given BLL in an individual, with an eye towards separating individuals with a high BLL due to the first two factors or the third. *As a start, the IEUBK can be used to gain an approximation to the relative contributions of these three factors under realistic ranges of inter-subject variation.*

3. ***Biologically relevant time averaging?*** For some individuals, exposure to Pb in water can be highly variable over time as Pb in premise plumbing and/or service lines is temporarily mobilized. The averaging time associated with IQ decrement is not well established at present, and so it is not clear how water sample results are to be averaged in calculating either individual or population risk. This has implications for both the ability to calculate risk and the ability to specify a sampling regime in water supplies to support assessments of the risk to individuals using those supplies. It is likely that the sampling regime established under the Lead and Copper Rule will be inappropriate for health assessments. *The review panel should therefore make recommendations as to the appropriate averaging time for exposures, which can then guide future designs of sampling.*

4. ***Individual or population risk?*** Approaches 1 and 2 rely on a change in the baseline BLL of a population. This is then related to the "probability of a child having an elevated BLL" (Approach 1) or "a 0.5 or 1 µg/dL increase in a child's mean BLL" (Approach 2). These two approaches are further specified as being related to an 'individual' BLL or risk. This is not a correct description however. The methodologies instead produce estimates of the FRACTION of individuals meeting these criteria. They are NOT measures of individual risk as suggested in the

NDWAC recommendations. In particular, under these methodologies, a given child does not have a "probability" of an elevated BLL; instead, there is a fraction of individuals with an elevated BLL. And in any event, all exposures, whether from water or not, produce an elevation of BLL. In addition, a given child does not have a "mean BLL". They instead simply have a BLL. The mean BLL referred to is presumably the mean for the exposed population (although this is not formally stated anywhere in the Pb report), which is a population risk metric, not an individual risk metric. It is possible that the EPA intends here the temporal mean for an individual, rather than the population mean. But this is not explained. *It is recommended here that the focus be on the distribution of changes in IQ within the exposed population, both at present from all exposure pathways combined and under the exposures that will occur after water supplies have been brought into line with any proposed health-based standard. All of this information can be produced under the methodology of Approach 3. This can then be combined with the information from point 1 above to calculate the number or percentage of individuals for whom any IQ change has moved them between categories of clinical or educational attainment.*

5. ***Which baseline BLL is relevant?*** Approaches 1 and 2 specify a "baseline BLL" in calculating EBLL. This baseline BLL is obtained from the distribution of non-water BLLs in the population. This has two problems. First is the inability to specify a population for whom the BLL is not already affected by water exposures. The second is that the more relevant metric is the baseline BLL for a given individual. The reasoning behind an approach based on the percentage of individuals with EBLL values exceeding 1% or 5% of the baseline is not clear. Instead, the approaches should consider the percentage of individuals whose personal background BLLs have been increased by 1% or 5% (or some other percentage). The problem lies in the statement in the EPA Pb report (see page 6 that Approach 1 is based on a process that will "Estimate the concentration of lead in drinking water that would result in a 1 or 5 percent increase in the probability of a child having an elevated BLL (EBLL)." As mentioned above, ANY concentration of Pb in water will 'elevate' the baseline BLL (as would any incremental concentration of PB in food, dust, air, paint etc). Therefore, the use of a criterion of identifying individuals for whom Pb in water causes an EBLL is scientifically incorrect. *The EPA should take care to define what they mean by an 'elevation' in BLL when giving the charge to the panel.*

6. ***What is the scientifically valid upper percentile of the BLL distribution***? Problems with truncation and correlation of biological parameters in the IEUBK model, which can cause deviations from lognormality in the tails of the distribution of BLL,

prevent estimates of BLL as far out as the 97.5th percentile. They may even prevent reliable estimates from being obtained at the 95th percentile. *Greater exploration is needed of the statistical properties of the distribution of BLLs in the tails, and the uncertainty in establishing percentiles of BLL out in those tails, before a specific percentile is specified as the basis for the approaches. The review panel should be given the charge of establishing the highest percentile that can be reliably estimated.*

7. ***Where do the high and low slope regions of the BLL-response curve lie for IQ decrement?*** As shown in Part I, the relationship between BLL and IQ decrement is characterized by a linear region below 5 to 10 µg/dL and extending down to zero, and a second region of significantly smaller slope above this first region. It is not yet clear in the proposed approaches what percentage of individuals modelled fall into these two regions. If the approaches are eventually to be related to IQ decrement and not simply BLL, the slope of the response curve will be required, and that will depend on the region into which an individual falls. This problem is removed if the approach to assessment considers the inter-subject variability distribution of BLL distribution of individuals following aggregate exposure via all pathways, and then determines the number or percentage of individuals for whom there is a significant improvement in IQ when waterborne Pb is restricted to a prescribed concentration that would form the basis of a health-based standard (see point 1 for more on this issue). *Such an approach could then use the full exposure-response curve, rather than assuming (incorrectly) that all individuals have exposures that place them into the low exposure, linear portion of the curve.*

8. ***1% or 5%, or 0.5 µg/dL or 1 µg/dL, increase in BLL?*** No justification is given for a 1% or 5% increase, or a 0.5 or 1 µg/dL increase, in BLL as the basis for the approaches. This is presumably related to some idea of a threshold level of IQ decrement to be allowed, but it is not stated. Particularly confusing is the first formulation as the percentage of individuals with a 1% or 5% "probability" of having an elevated BLL. Putting aside the issue that these are not actually probabilities at all, but rather population frequencies, some justification is needed for why these particular percentages have been selected as indicators of adversity in a population (bearing in kind again that while Approach 1 is called an individual risk approach, the methodology is one of frequency in a population, not an individual's probability).

Part III. Draft response to EPA charge questions

This analysis now turns to the charge questions posed by the EPA. All of the issues raised here are covered in Parts I and II of the present analysis, but reformulated to match the charge questions.

III.1. Model Scenarios

Please comment on the strengths and weaknesses associated with the decision to model three life stages: 0-6 months, 1-2 years, and 0-7 years. Please comment on whether there are additional life stages that should be considered by EPA. Please also comment on the strengths and weaknesses of the modeling scenarios conducted, i.e., exposure scenarios for drinking water only and all pathways, and target blood lead levels (3.5 µg/dL and 5 µg/dL at several upper tail percentiles of the population). Please identify additional scenarios that would add utility.

Answer: The age groupings are appropriate, albeit somewhat arbitrary given the lack of clarity on a biologically relevant averaging time for exposures to Pb. One might imagine smaller windows of development that could be examined, but the clinical and epidemiological data are not sufficient to allow for this greater level of temporal resolution. *This remains an unresolved problem with the available clinical and epidemiological database; the review panel should be given the charge to bring greater scientific clarity to this issue*.

The modeling scenarios and methodology for Approach 3 are valid and generally comport with probabilistic risk assessment in other areas of EPA regulation. It is less relevant to consider the water-only exposures represented in Approaches 1 and 2, as these do not occur in reality and prevent identification of the most important risk mitigation measures from amongst the contributors to aggregate risk. It is important to retain Pb exposures in the context of aggregate exposure assessment to allow for risk mitigation decisions in allocating limited regulatory resources.

Approaches 1 and 2 are each an odd combination of individual and population risk. This is especially true of Approach 1 where there is reference to the "probability" that an individual has an elevated BLL. In reality, exposure by any single pathway will produce at least some elevation of BLL relative to the blood Pb that would occur without that pathway. The probability of an elevated BLL is therefore by definition 100% regardless of the scenario examined. Therefore, this formulation of the charge question is scientifically meaningless.

There is nothing in the methodology or the scenario for Approach 1 that refers to a truly individual risk in the scientific sense. Instead, the Approach 1 methodology speaks to calculation of the percentage of individuals with an elevated BLL, which is a population characteristic. The issue with Approach 2 is less severe, but still raises the question of what is meant by an individual's "mean BLL". The mean BLL appears to be the mean of the population.

There is a possibility that the wording of Approach 2 is intended to convey the temporal mean of an individual's BLL, but this is not stated. It is not evident therefore how the review panel will interpret this Approach. And in any event the averaging time for the latter meaning is not specified. *Approaches 1 and 2 are therefore beset by conceptual difficulties and lack of clarity that make these approaches questionable as a basis for a health-based standard.*

For the purpose of risk mitigation, an "inverse" scenario should be added to the assessment. By this is meant a scenario in which (as in Approach 3) exposures to all pathways are assessed in a representative distribution of individuals, and then only the waterborne Pb removed to calculate the decrease in BLL that would result. This should include consideration of the fact that the exposure-response curve for IQ decrement has at least two distinct regions with very different slopes, as shown in Figure 1. The additional assessment recommended here would calculate the probability density function of the percentage of individuals for whom restriction of waterborne Pb at different candidate levels would produce a given level of reduction in BLL. Such an approach would also feed well into a public health and a cost effectiveness calculation, allowing calculation of the percentage or number of individuals for whom removal of Pb in water (down to candidate limits) would produce a given IQ increase or move the individuals between IQ categories defined by clinical and/or educational attainment on which welfare depends.

The peer review panel should seek to bring the clarity needed above, reformulating the approaches so the terminology is more correct scientifically and statistically.

III.2. Model Inputs

Please comment on the strengths and weaknesses, including suggestions for improving the input parameters (i.e., point estimates and distributions) for the IEUBK and SHEDS modeling approaches. Please identify any data gaps or additional data related to the various input parameters that could improve the exposure and BLL estimates. Please comment on the appropriateness of the water consumption rate based on NHANES data for this modeling effort.

Answer: The model inputs are generally scientifically sound. However, there remains significant lack of clarity on the correlation between input parameters for individuals. This is important because several of the approaches recommend calculation of percentiles of individuals out into the far tails (95% and 97.5%) of distributions. Absent rigorous treatment of both correlation and truncation, it is invalid to perform calculations this far out into the tails, as the underlying assumption of lognormality is likely to be violated.

SHEDS continues to use data on waterborne exposures that do not reflect the relative contribution of premise plumbing and service lines in exposure to waterborne Pb. This makes it impossible to use SHEDS to study the most critical risk mitigation issue: whether mitigation should be at the level of the distribution system or premise plumbing. *The review panel should therefore consider whether data are available that could remove this problem.*

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The statistical properties of the parameters in the IEUBK model are not well established at present. They are largely expert judgments by the model developers. A more robust analysis is needed, especially since this can greatly affect the results out in the tails of the distributions of BLLs in a population. *Again, the peer review panel should re-examine the scientific basis for these statistical properties*.

It is not clear why the NHANES data have been used for the water consumption rate, given that detailed distributions – by age category - have been developed for the Exposure Factors Handbook and there are significant differences between the EFH and NHANES values. It is understandable that the use of NHANES consumption rates allows comparison against the NHANES BLL values on an individual-by-individual basis, so long as the consumption rates reported by participants are correct. However, it is not clear in the Pb report how this comparison (of water intakes and BLLs) is to be used in the final assessment. *The peer review panel should therefore consider whether the enhanced analytical ability offered by the NHANES data for comparisons of exposure and BLL outweighs concerns over replacement of the EFH values for water consumption*.

Approach 3 uses a regression equation for waterborne exposures. This approach is scientifically valid in general, but little detail is provided concerning the strength of the regressions. *The peer review panel should consider the uncertainty introduced by development and use of the regression equation, including scientifically valid quantitative characteristics of the reliability of the regression (e.g. error bars on coefficients in the regression model)*.

III.3. Modeling Approaches

EPA demonstrated three modeling approaches. The first two are individual-based deterministic (with central tendencies) approaches using IEUBK modeling, and the third is a population-based probabilistic approach using SHEDS-Multimedia coupled with the IEUBK model. "Approach 1" determines the concentration of lead in drinking water associated with a percentage increase in the probability of an individual "representative" child experiencing an elevated BLL. "Approach 2" determines the concentration of lead in drinking water that would result in a 0.5 µg/dL or 1 µg/dL increase in a child's mean BLL for an individual "representative child" exposed to lead in drinking water. "Approach 3" determines drinking water lead concentrations that would keep particular percentiles of simulated national BLL distributions of different aged children below a defined benchmark BLL.

a. Compare and contrast each approach and comment on the strengths, weaknesses, and uncertainties of each as well as the utility of the different ways the outputs are presented.

b. Please comment on the strengths and weaknesses of using the IEUBK model to predict drinking water concentrations that may result in specific increases in BLLs and/or increased probability of elevated BLLs.

c. Please comment on the potential utility of using the SHEDS-IEUBK approach (currently used in Approach 3) to develop an estimate the concentration of lead in drinking water associated with a percentage increase in the probability of an individual child experiencing an elevated BLL as is done in Approach 1 (using only IEUBK). Please also comment on the utility of using the SHEDS-IEUBK approach to identify the concentration of lead in drinking water associated with a specified increase in the geometric mean (GM) BLL for a population exposed to lead in drinking water as is done in Approach 2 (using only the IEUBK)

Answer: As mentioned above, Approaches 1 and 2 suffer at present from confusion over whether the BLL metrics are individual or population based. They are stated to be individual risk metrics but are in fact disguised population risk approaches. The terminology of an individual's "probability" is therefore incorrect, since the methodology appears to be based on calculating the frequency with which a give BLL is exceeded in a defined population. *The peer review panel should consider this issue closely and provide greater clarity to the terminology, the nature of the distributions produced and the applications to which a given result (under a given terminology) will be scientifically valid.*

Only Approach 3 gets the distinction between individual and population risk correct. However, it is referred to throughout as a population risk metric. This is not correct. It is instead calculating a probability density function for BLL and uses information on the distribution of input values for individuals. It is therefore a probability density function for BLL values for individuals. Admittedly it does not focus on the BLL for a given specified individual, but then neither do the other two approaches. It comports most closely with EPA practice in other areas of probabilistic risk assessment; allows for consideration of aggregate exposure/risk (a necessary feature of modern risk assessment); and is suited to use in risk mitigation where relative cost effectiveness across different exposure routes is considered.

With respect to question (b), putting aside the issue of incorrect use of the term "probability", the IEUBK model is an appropriate basis for these calculations. There are competing models available, but they are no better (or worse) than the IEUBK, and the IEUBK has been through several rounds of peer review. There is growing consensus amongst stakeholders on its use in these kinds of analyses. There is nothing in the IEUBK to prevent it from being used in the specific applications mentioned (so long as the difference between population frequency and individual probability is resolved).

Also with respect to (b), *the peer review panel should provide a more detailed exploration of the ability of the IEUBK to make estimates out into the far tails of the distributions. They should make a recommendation as to the furthest percentile for which it is valid to make such calculations (90th, 95th etc).*

With respect to question (c), it is not clear why one would want to use Approach 3 to address the questions of Approaches 1 and 2, rather than using Approach 3 directly. Using the

probability density function produced by Approach 3, it is possible to estimate the "probability" (again, an incorrect terminology) and geometric mean BLL as appears in the descriptions of Approaches 1 and 2, but it is not clear why one would want to do this as it reduces the full PDFs to simple statistical summaries.

The wording of the charge question refers to a "geometric mean" BLL, a form of central tendency estimate. However, the report itself refers to the mean BLL. The mean is more important than the geometric mean or median, as it is the basis for calculations of total health decrement to society. It is assumed this is simply a mistake in the wording of the charge question. If not, the difference needs to be explained.

III. 4. Model Evaluation and Multimedia Exposure Pathway/Sensitivity

Please comment on the strengths and weaknesses of the three approaches for considering the CDC NHANES blood lead data. Please also comment on the strengths and weaknesses associated with the approach to modeling the exposure pathway. Please comment on what type of sensitivity analysis would be useful to analyze aggregate lead exposures and identify key model inputs.

Answer: This is an important question for the peer review panel. Tying the analysis to the NHANES data provides an opportunity to provide more robust and complete data on individual exposures and BLL values. The NHANES data also provide the most complete set of empirical studies on which to validate the modeling and to specify the baseline BLL distributions used in Approaches 1 and 2.

However the NHANES data are less than perfect with respect to exposures through the different pathways for an individual. As a result, it is not clear how one would separate out individuals whose BLL is relatively unaffected by water exposures so the baseline BLL distribution can be developed. *The peer review panel should therefore consider whether the enhanced ability to examine individual-specific exposures and BLL values outweighs the concern over reduced quality of the exposure estimates and the relative contributions of exposures by the different pathways.*

A sensitivity analysis certainly is required for all components of the modelling. A question will be whether this should be a sensitivity or uncertainty analysis; an uncertainty analysis is the more informative method in directing additional resources in model improvement. If a sensitivity analysis is performed, a question for the peer review panel will be whether this should be a global or local sensitivity analysis. The answer to this will depend on the extent of correlation between model inputs. *The peer review panel should weigh in on this issue and describe how the analysis should be performed.*

III.5. How could each of these approaches be improved for the purposes of evaluating drinking water concentrations associated with increased/elevated BLLs?

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Answer: This is an appropriate question for the peer review panel. However, as mentioned previously, this question must be preceded by answers to the questions mentioned above of clarity on the meaning of individual and population exposures, especially with respect to Approaches 1 and 2. Until those issues are clarified, it will not be possible to determine whether those two approaches are fit to purpose. *With the current wording, neither Approach 1 nor Approach 2 produces the information needed for risk mitigation decisions within an aggregate risk context; this issue is explored further below*.

Having addressed that issue of clarity, the panel should turn next to consideration of improvements in the databases required for all three approaches, including the SHEDS database for Approach 3. *The panel must assess the correlation and truncation structures of those data, or at least specify how the EPA should conduct such an assessment*. Until that is done, it is not clear how far into the tails of the distributions any of the approaches can reasonably consider.

It is recommended that this charge question be slightly reformulated to address the issue raised earlier of adversity of BLL increases. As mentioned, ANY waterborne Pb will increase the baseline BLL to some extent. Following the reasoning employed in other EPA regulatory decisions, the question is whether this increase is significant in regard to clinically relevant changes. The charge question should therefore be worded as: *How could each of these approaches be improved for the purposes of evaluating drinking water concentrations associated with clinically significant increased/elevated BLLs?*

Finally, and most importantly, there is a pressing need for a further assessment related to Approach 3, but producing the 'inverse' information from that approach. This further assessment should produce a probability density function for BLL values in a defined population under conditions of complete aggregate exposure via all pathways. The database on water exposures should then be combined with different candidate levels in water to calculate (1) the improvement in BLL, (2) the improvement in IQ and (3) improvement (if it occurs) in placement of each individual within the clinical and educational attainment categories. The intent here is to determine the effectiveness of water standards as a risk mitigation option relative to the other pathways. *The review panel should be given guidance as to how such an assessment might be generated, and charged with commenting on both the scientific basis for such an assessment and the range of analyses and decisions to which it might be applied*.

ED_001523_00007956-00032

To: Dravis, Samantha[dravis.samantha@epa.gov]
Cc: Chai, Amy[achai@nahb.org]
From: Spielvogel, Tamra
Sent: Wed 4/26/2017 5:15:28 PM
Subject: RE: NAHB Follow-up Information on RRP Program
removed.txt

Samantha,

I wanted to follow up on our emails from earlier this month. While I know it has been a busy few weeks for all with both Easter/Passover holidays and a full agenda on the policy front we would still be interested in setting up a follow-up conversation to discuss this issue with you further. In fact, we will actually have a remodeler member coming to town this Monday to participate in the afternoon meeting the Office of Pollution Prevention and Toxics (OPPT) is having on "Regulatory Reform Agenda for Lead Exposure Reduction." If you had time available to meet after that event ends at 2:30p it would be beneficial to be able to provide you a practitioner's point of view on the program.

Thank You,

Tamra

TAMRA SPIELVOGEL Program Manager, Environmental Policy

National Association of Home Builders
1201 15th Street, NW | Washington, DC 20005
d: 202.266.8327 e: tspielvogel@nahb.org w: nahb.org

From: Dravis, Samantha [mailto:dravis.samantha@epa.gov]
Sent: Monday, April 03, 2017 1:55 PM
To: Spielvogel, Tamra <TSpielvogel@nahb.org>
Cc: Chai, Amy <achai@nahb.org>
Subject: RE: NAHB Follow-up Information on RRP Program

Thanks for all this, Tamra. Give me a chance to digest and then let's set a follow up call.

Best,

Samantha

From: Spielvogel, Tamra [mailto:TSpielvogel@nahb.org]
Sent: Monday, April 3, 2017 1:29 PM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Chai, Amy <achai@nahb.org>
Subject: NAHB Follow-up Information on RRP Program

Dear Ms. Dravis,

I'm emailing in follow-up to your conversation with Michael Mittelholzer at the NAHB meeting with Administrator Pruitt last week. I know several issues were discussed for additional follow-up during the meeting with the Administrator including the Renovation, Repair and Painting (RRP) Program and stormwater issues which my colleague Eva will be following up with you on in a subsequent message.

Attached is the material you and Michael discussed to provide additional detail regarding NAHB's concerns regarding implementation and evaluation of the RRP program. Specifically I have provided copies of NAHB's comments related to the Section 610 review as well as those NAHB submitted during both public comment periods EPA opened during the review of issues related to the lack of an approved lead test kit. Also, for your information I am including copies of two petitions NAHB has filed with EPA on the RRP program. The most recent was in regards to the changes made to the refresher training course requirements which was denied by the agency in December 2016. The EPA response is also enclosed. I have enclosed the 2010 petition because while the other documents discuss the issues we have with the economic analysis of the rule, it was most comprehensively addressed in this petition on the test kit.

Finally, I was also told you are interested in the report where EPA's cost benefit estimates were called into question. The report was issued by the EPA Office of the Inspector General. The following link will take you to the OIG page for the report where you can access their findings, the report, as well as the responses exchanged between OIG and EPA on the report.

•□□□□□□□□ https://www.epa.gov/office-inspector-general/report-review-hotline-complaint-concerning-cost-and-benefit-estimates-epas

I would note that one of the commitments made by the EPA to the OIG was to collect better data but they made the commitment to do so in the context of a separate rulemaking (the development of an RRP rule for Public & Commercial Buildings) and that survey is currently underway. NAHB individually and as part of an industry coalition has called into question the efficacy of this effort. While the data may be useful to the residential program collecting it in the context of the Public & Commercial Buildings rule has never seemed appropriate or truly illustrative given a range of other differences between the two rules. Furthermore, the data is being collected prior to establishing a hazard for Public & Commercial Buildings.

NAHB looks forward to continuing the dialogue with EPA on this program and we would appreciate the opportunity to set up a meeting with you and your team to discuss these issues further. Please feel free to contact me at 202-266-8327 or tspielvogel@nahb.org.

Regards,

Tamra Spielvogel

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To: Dravis, Samantha[dravis.samantha@epa.gov]; Sugiyama, George[sugiyama.george@epa.gov]; Kime, Robin[Kime.Robin@epa.gov]
Cc: Kelly, Kerry[KKelly5@wm.com]; Carol McCabe (CMcCabe@mankogold.com)[CMcCabe@mankogold.com]; Ball, Christopher[cball2@wm.com]; Mack McGuffey (mack.mcguffey@troutmansanders.com)[mack.mcguffey@troutmansanders.com]; Kevin Kraushaar (kkraushaar@wasterecycling.org)[kkraushaar@wasterecycling.org]; Barry Shanoff (bss@shanlaw.net)[bss@shanlaw.net]
From: Kelly, Kerry
Sent: Wed 3/15/2017 5:20:32 PM
Subject: Waste Management, Inc. Request for a Meeting
Letter to EPA Acting Officials - Petition for Reconsideration Enclosed (1683559_1).PDF

Dear Ms. Dravis and Mr. Sugiyama:

At the suggestion of Al Collins of Occidental Petroleum (Oxy), who met with you last week and now sings your praises, I am writing to request a meeting with you at your earliest convenience to discuss a set of rules promulgated by EPA pursuant to Section 111 (b) and (d) of the Clean Air Act that impose revised performance standards for both new and existing municipal solid waste (MSW) landfills. The regulations were promulgated as part of President Obama's *Climate Action Plan: Strategy to Reduce Methane Emissions*.

Waste Management, along with Republic Services, the National Waste & Recycling Association and the Solid Waste Association of North America (associations representing both public and private organizations and professionals) identified a number of substantial issues of law and policy with the new rules, including overlap and conflict with existing rules governing the same landfill sources. We have asked EPA to stay, reconsider and revise the two climate-related rules. We petitioners have also challenged the new rules in the U.S. Court of Appeals for the D.C. Circuit.

The landfill rules share similarities with other regulations that EPA may reevaluate, including the Clean Power Plan and Oil & Gas Rules:

•□□□□□□□ The new rule for existing landfills relies on the same Section 111(d) authority for which the Clean Power Plan has been criticized; and

•□□□□□□□ The cost/benefit analyses underpinning the more stringent performance standards in the rules rely heavily on the "social cost of methane," which is derived from the "social cost of carbon."

Should the Agency decide to rethink those elements in other rules, we believe it would be advisable to reconsider the landfill rules as well. Although we petitioners are prepared to move forward with the judicial challenge, we believe a reconsideration of the rules could lead to a better outcome without the need for litigation. While rule revisions are our ultimate goal, an administrative stay of the rules under the Administrative Procedures Act is critical to avoid forcing the regulated community and the states to begin implementing these flawed rules. Many states are already engaged in developing their mandated state plans for implementation, which are due to the EPA by May 30, so our request for a meeting is time-critical.

I am attaching a recent letter we petitioners sent to EPA prior to Administrator Pruitt's confirmation. It includes our somewhat lengthy administrative petitions. I would be happy to follow-up next week by phone to identify a convenient time on your doubtless busy schedules. Several participants will be coming from out of town, including a former colleague of Mr. Sugiyama, Mack McGuffey of Troutman Sanders, but we can be flexible in accommodating your schedules.

Thank you in advance, and I very much look forward to meeting you.

Kerry Kelly

Carter Lee "Kerry" Kelly

Senior Director, Federal Affairs

Kkelly5@wm.com

WM Waste Management

701 Pennsylvania Ave., NW, Ste 590

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202.639.1218 office

571.377.9202 cell

Recycling is a good thing. Please recycle any printed emails.

To: Dravis, Samantha[dravis.samantha@epa.gov]
Cc: Bolen, Brittany[bolen.brittany@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
From: Lorraine Gershman
Sent: Tue 5/16/2017 2:47:45 PM
Subject: RE: Follow up on NSPS DD: Grain Elevators
NSPS DD Letter to Dravis Regulatory Reform FINAL 5-15-17.pdf
NOPA Reg Reform FINAL 05.15.17.pdf

Samantha,

As a follow up, here are the filed comments of the NSPS DD Coalition on EPA's proposal to evaluate existing regulations, along with NOPA's comments. In these remarks we ask that EPA's newly-formed Regulatory Reform Task Force recommend to the Administrator to:

1)Not finalize the proposed amendments to NSPS Subpart DD; and

2)Formally rescind the July 9, 2014 proposed amendments to NSPS Subpart DD. By formally rescinding this rule, EPA would be able to "bank" the costs of this rule in order to offset the costs of a future rule, as detailed in E.O. 13771 - Reducing Regulations and Controlling Regulatory Costs.

Furthermore, we encourage EPA to look to the possibility of rescinding this NSPS ***prospectively*** and/or modifying it based on the Coalition comments submitted in 2014, as part of a larger Regulatory Reform effort.

We have also shared these comments directly with Josh Lewis.

Best,

Lorraine

From: Lorraine Gershman
Sent: Tuesday, May 09, 2017 5:06 PM
To: 'dravis.samantha@epa.gov' <dravis.samantha@epa.gov>

Cc: 'bolen.brittany@epa.gov' <bolen.brittany@epa.gov>; 'gunasekara.mandy@epa.gov' <gunasekara.mandy@epa.gov>
Subject: Follow up on NSPS DD: Grain Elevators

Samantha, thank you again for meeting with the Regulatory Improvement Council (Valis Associates) this morning. It was a pleasure to hear from you regarding some of industry's big concerns.

As I mentioned in our brief discussion, NOPA is a part of a coalition of agribusiness trade associations that have been working on the NSPS DD: Grain Elevators for the last decade. In October 2016, EPA's final NSPS package was sent to OMB for review under EO 12866. The revisions would include new emission limits for certain grain elevators; additional testing, monitoring, recordkeeping and reporting requirements; different compliance requirements for periods of startup, shutdown and malfunction; and a new method for calculating emissions from temporary storage facilities. The final rule would apply to grain handling facilities on which construction, modification or reconstruction began after July 9, 2014 - the date the proposed amendments were published in the *Federal Register*. This rule package was not finalized by EPA, and on January 24, 2017, the rule was officially withdrawn from OMB. (See: https://www.reginfo.gov/public/do/eoDetails?rrid=126938) At this point in time, we are uncertain if this rule is going to be resubmitted to EPA for review or if EPA will no longer pursue revision of NSPS Subpart DD. That said, in order to not subject new grain elevators to these burdens, it is critical that EPA:

1) not finalize the proposed amendments to NSPS Subpart DD; and 2) formally rescind the July 9, 2014 proposed amendments to NSPS Subpart DD. By formally rescinding this rule, EPA would be able to "bank" the costs of this rule in order to offset the costs of a future rule, as detailed in E.O. 13771 - Reducing Regulations and Controlling Regulatory Costs. Furthermore, we encourage EPA to look to the possibility of rescinding this NSPS, and other outdated NSPS, as part of a larger Regulatory Reform effort.

Jess McCluer, my counterpart at NGFA, briefed Josh Lewis on this issue at the OSDBU stakeholder meeting last month, and requested a meeting. Josh's response was that he is talking to colleagues in the air office and will be in touch soon to discuss next steps.

The coalition will be submitting more detailed comments on this issue to the docket next week, and we are happy to meet with you or the relevant contact person to discuss this issue in more detail.

(As an aside, I was encouraged to hear about EPA's intentions to bring back the Sector Strategies program. I was involved in that effort, and the CAAAC multipollutant sector strategy effort as well, when I was with the American Chemistry Council and found value in both efforts. And I also support EPA educational visits to regulated facilities. I worked with Penny Lassiter in OAQPS to have several of her technical staff accompany me to ethylene production facilities in advance of the RTR efforts.)

Please do not hesitate to contact me if I can be of further assistance.

Best,

Lorraine Gershman

Lorraine Gershman, P.E.

Vice President, Regulatory Affairs

National Oilseed Processors Association

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May 15, 2017

VIA ELECTRONIC MAIL

Office of Regulatory Policy and Management
Office of Policy
Environmental Protection Agency
1200 Pennsylvania Ave. NW
Washington, DC 20460

Re.: NOPA's Comments on Evaluation of Existing Regulations (82 Fed. Reg. 17,793)
(Docket ID No. EPA-HA-OA-2017-0190)

Dear Ms. Dravis:

The National Oilseed Processors Association (NOPA) appreciates the opportunity to submit comments on EPA's Evaluation of Existing Regulations (82 Fed. Reg. 17,793, April 13, 2017).

The National Oilseed Processors Association (NOPA) is a national trade association that represents 13 companies engaged in the production of food, feed, and renewable fuels from oilseeds, includ ing soybeans. NOPA's member companies process more than 1.8 billion bushels of oilseeds annually at 64 plants located in 20 states throughout the country.

The NAICS code that directly applies to oilseed processing facilities is 311224 – Oilseed processing. NOPA member company facilities range in size from small, family -owned businesses to large multi - national corporations.

NOPA belongs to the New Source Performance Standard (NSPS) DD Coalition, the National Ambient Air Quality Standards (NAAQS) Implementation Coalition (NIC), and the Food Associations Coalition managed by Herbert Estreicher of Keller and Heckman and fully support the comments submitted by those groups to this docket.

Regulatory Burden/Compliance

The ever-changing landscape of regulatory requirements for manufacturing facilities results in more and more resources devoted to compliance, in lieu of investing in new equipment and additional jobs. The list compiled below reflects regulations and policies that have a detrimental impact to the oilseed processing industry.

1) ***EPA's NAAQS/Preconstruction Permitting Process***. One of the biggest concerns with NAAQS is that a new/revised NAAQS is effective almo st immediately after finalization, without any accompanying implementation regulations. A facility undergoing permitting may have to restart the entire permitting process in order to accommodate a revised NAAQS that becomes effective before the final permit is issued. The PSD regulations are highly complex and their implementation is largely achieved through ever -changing EPA guidance and policy documents that have not gone through rulemaking. As noted in comments below and in more detail in the comments su bmitted by the NIC, EPA's Appendix W modeling requirements do not accurately predict emission impacts for all

facilities, and can lead to overly restrictive pollution control requirementsEPA should strive to promptly issue implementation regulations afte r a new NAAQS is finalized in order to provide certainty to the regulated community.

2) ***EPA's NSPS DD (Grain Elevators) Rulemaking***. As noted in the comments submitted by the NSPS DD Coalition, NOPA is a part of a coalition of agribusiness trade associations that have been working on the NSPS DD: Grain Elevators for the last decade. In October 2016, EPA's final NSPS package was sent to OMB for review under EO 12866. The revisions would include n ew emission limits for certain grain elevators; additional testing, monitoring, recordkeeping and reporting requirements; different compliance requirements for periods of startup, shutdown and malfunction; and a new method for calculating emissions from te mporary storage facilities. The final rule would apply to grain handling facilities on which construction, modification or reconstruction began after July 9, 2014 - the date the proposed amendments were published in the *Federal Register*. This rule package was not finalized by EPA, and on January 24, 2017, the rule was officially withdrawn from OMB. We are uncertain if this rule is going to be resubmitted to OMB for review or if EPA will no longer pursue revision of NSPS Subpart DD. That said, so as to not subject new grain elevators to these burdens, it is critical that EPA: 1) not finalize the proposed amendments to NSPS Subpart DD; and 2) formally rescind the July 9, 2014 proposed amendments to NSPS Subpart DD. Furthermore, we encourage EPA to look to the possibility of rescinding this NSPS, and other outdated NSPS, as part of a larger Regulatory Reform effort.

3) ***EPA's Startup, Shutdown, and Malfunction (SSM) Policy.*** Beginning with the court decision in Sierra Club v. Johnson, 551 F.3d 1019 (D.C. Cir. 2008) , EPA has required facilities to be in continuous compliance with normal emission and operating limits, without allowing for any deviations due to unforeseen circumstances. If an event occurs that causes the facility to exceed a limit, the facility is at the mercy of the regulatory authority's discretion regarding enforcement for that event. Since this court decision, EPA has rarely allowed for the use of a work practice during the startup and shutdown periods of operation. EPA should look to set work pract ice standards or set alternative emission limits during periods of SSM, as allowed under sections 112(d)(2) and 112(h) of the Clean Air Act (CAA)

4) ***EPA's Risk and Technology Review (RTR) Rules*** . Section 112(f) of t he CAA requires EPA to review National Emission Standards for Hazardous Air Pollutants (NESHAP) rules after eight years toevaluate the remaining risk posed by the regulated facilities, andsection 112(d)(6) of the CAA requires EPA to review advances in pollution control technologies. EPA has been slowly conducting these RTR rules over the past decade, and faces many more in the next few years. Despite regularly finding low residual risk from various regulated facilities, EPA has regularly pushed for lower emission limits, requiring the installation of expensive new equipment with limited to no demonstrated benefits. EPA should focus its reviews on ensuring that the NESHAP rules are effective, pose little residual risk, and do not impose additional costs on regulated industry without demonstrated benefits.

5) ***Federal Response Plans (FRP)***. EPA requires facilities that store over one million gallons of oil to prepare a Federal Resp onse Plan . For the oilseed processing industry, this requirement also applies to vegetable oil, which is one of the primary products of our business. A FRP is required even if the facility has adequate secondary containment for their oil tanks. The FRP req uires that regulated facilities have a contract with an oil spill response organization (OSRO) to provide emergency response if needed. Often, this contract requires a retainer be paid to the OSRO based on the amount of oil that the facility

stores. Because these facilities generally have adequate containment, the OSRO's services is rarely needed. In order to provide a timely response to a spill, facilities may be required to buy and maintain a boat to deploy spill -containing booms on a water body. Facilities with a FRP are also required to hold periodic costly drills. Finally, FRPs duplicate requirements in the Spill Prevention Control and Countermeasure (SPCC) plans – in particular, the Emergency Response Action Plan (ERAP). EPA should look to remove duplicative requirements that add burden to regulated facilities. One way for EPA to minimize the burden on vegetable oil producers is to exclude vegetable oil from the definition of "oil" in the FRP, and instead require vegetable oil producers to prepare only SPCC plans.

6) ***TSCA Reporting Requirements.*** The Toxic Substances Control Act (TSCA) requires facilities to regularly report the manufacture or use of chemicals in commerce. This requirement also applies to food products that are used for non-food uses. Although these substances are regulated by FDA for human consumption, if the same substance is used for a non -food use, information about its end use, production volumes , and other information is required to be reported. As requested in the the Food Associations' comments, EPA should eliminate the TSCA CDR reporting requirements for food substances already regulated by FDA.

7) ***Regional Consistency Requirements***. On August 3, 2016, EPA finalized revisions to its Regional Consistency regulations to more clearly address the implications of adverse federal court decisions that result from challenges to locally or regionally applicable actions. These revisions introduced a narrow procedural exception under which an EPA Regional office no longer needs to seek Headquarters concurrence to diverge from national policy in geographic areas covered by such an adverse court decision. EPA claimed that the revisions will help to foster overall fairness and predictability regarding the scope and impact of judicial decisions under the Clean Air Act, but in fact, it provides little regulatory certainty to companies that have operations in multiple EPA regions. EPA should reconsider this regulation.

8) ***EPA Electronic Reporting Requirements.*** In many new rules, EPA has begun requiring facilities to submit testing data electronically, such as through CEDRI. The goal of these rules is to reduce the paperwork burden; however, this has not yet been accomplished. For many of these rules, the states also need to obtain the test data, and not all states have access to EPA's database. In some cases, EPA requires the submittal of data before the testing companies can reformat their results to comply with EPA's rule, or EPA's database is not yet ready to accept testing data. EPA should work to ensure that all states have access to the same facility data to reduce duplication of effort for the regulated parties, and that the electronic databases and submittal portals are extensively tested before use.

9) ***Rulemaking through guidance.*** EPA has frequently issued guidance documents that served as de facto regulations, but these documents never underwent public notice and comment. Many are not even considered final agency actions and therefore can't be challenged. One such example is the 1990 New Source Review Draft Guidance . Even though this document is 27 years old and was never finalized, it still serves as the basis for many NSR permitting decisions. All federal Agencies should follow the proper notice and comment procedures to ensure that the regulations are being interpreted and applied consistently.

Manufacturing Permitting Process

New oilseed processing facilities undergo a lengthy and detailed environmental permitting process. This permitting process is filled with many challenges that can derail a project, including uncertainty in schedule for obtaining a final permit, the requirement to model emissions using programs that cannot account for site-specific inputs, and public input and challenges. Once a project hits a roadblock or is substantially delayed, the project may be scrapped and the accompanying jobs and growth would disappear.

A new or modified oilseed processing facility may need to obtain a preconstruction (Prevention of Significant Deterioration (PSD)/ Nonattainment New Source Review (NNSR)) air permit, a National Pollution Discharge Elimination System (NPDES) wastewater permit, an Army Corps wetlands permit, a state building permit, a state groundwater withdrawal permit, as well as develop numerous plans, including facility response/Spill Prevention Control and Countermeasure (SPCC), Process Safety Management (PSM)/Risk Management Plan (RMP), and Food Safety Modernization Act (FSMA). Furthermore, these facilities may also need to undergo the following reviews: Wetlands Assessments and Surveys, Threatened and Endangered Species and Habitat Assessments and Surveys, Floodplain Assessments and Surveys, Cultural Resources Assessments and Surveys, U.S. Army Corps of Engineers Clearances, and Section 401 State Water Quality Certifications. Once the preconstruction reviews and permits are secured, these facilities then need to obtain operating permits.

A large majority of these permits are regulated under EPA.For most environmental permits, the states have the authority to issue permits, with an EPA review often required. Such permits require dedicated permit staff in each state that are familiar with permitting requirements and facility operations.

For the past few years, states have struggled to balance their budgets, and permit writers have often been eliminated as part of budget cuts, losing experience and knowledge of the applicability of the rules and the industries under permit. At the same time, many states have been trying to welcome new manufacturing facilities and new jobs, resulting in a permit backlog that has not yet been resolved. Facilities will not be built unless permits can be issued in a timely manner.

Typically, the most onerous regulatory review/permitting program for oilseed processing facilities has involved air permitting. Over the past seven years, EPA has tightened several ambient air quality standards while increasing its reliance on modeling to demonstrate attainment and project impacts. For example, in 2010 EPA finalized a one-hour NO_X standard, only to later discover that models are predicting exceedances where monitors demonstrate attainment. At the same time, EPA has been slow to issue guidance to the state permitting agencies and has failed to highlight flexibility states have in drafting permits. As such, many permits have gotten bogged down, lengthening the timeline to permit issuance and increasing the permit backlog at the states.

Some specific examples of technical issues that recent industrial projects have encountered include:

- There is no formal mechanism for the States or the regulated community to implement any changes in the model or methods via EPA guidance or 40 CFR 51 Appendix W. Without changes to the model or methods, states are wed to using the current suite of modeling tools which frequently do not account for site-specific conditions and overestimate projected impacts. An overestimate of projected emission impacts may result in a facility having to install costly, unneeded control technology or a project not moving forward at all.
- Currently approved modeling programs do not adequately represent all facility scenarios. When modeling is compared to actual monitoring data, the model proves to be overly conservative. By having overly conservative models, some facilities have not been able to

demonstrate attainment with the current standards and have been forced to abandon new projects.

- Finally, in many cases EPA has failed to provide direction to the states which are responsible for permitting industrial facilities. Without guidance from EPA, many states are struggling to determine what is acceptable to EPA, and may resist innovative and flexible approaches. The result is that projects may be scrapped,along with any new jobs that would have accompanied the project.

Recently, several NOPA members have announced new facilities or expansion of existing facilities, and have undergone the permitting process. One of the most trying aspects of the permit process is the never-ending uncertainty in the process itself. Any minor comment or correction may result in another full review of the permit application. Each delay in the permit process might result in changed limit or guidance that must now be addressed in the permit. This would include a new NAAQS, or a ratcheting down of a storm water benchmark. A final permit is rarely final until all appeals are exhausted.

In conclusion, NOPA appreciates this Administration's efforts to relieve some of the regulatory burdens faced by the oilseed processing industry. Thank you in advance for your consideration of NOPA's comments. If you have any questions, or will like to further discuss our comments, please contact me at lgershman@nopa.org or 202-864-4368.

Sincerely,

Lorraine Krupa Gershman, P.E.
Vice President, Regulatory Affairs

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To: Dravis, Samantha[dravis.samantha@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Bolen, Brittany[bolen.brittany@epa.gov]
Cc: Kelly, Kerry[KKelly5@wm.com]
From: McGuffey, Carroll Wade
Sent: Mon 5/1/2017 9:54:46 PM
Subject: RE: Follow Up
Comments on Evaluation of Existing Regulations per EO 13777.pdf

Dear Samantha, Mandy, and Brittany,

Thank you again for your continued interest in our concerns regarding the Section 111 air rules for MSW landfills. As indicated previously, we are planning to raise our concerns in comments on EPA's evaluation of existing regulations per executive order 13777. We plan to submit the comments to the docket by the deadline of May 15th, but we also thought you all might appreciate receiving a copy a bit earlier, given the time pressure I'm sure you are under with regard to these regulatory reform efforts. If you have questions, please don't hesitate to contact us at your convenience.

Mack McGuffey
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May 1, 2017

Transmitted electronically: ***www.regulations.gov***
Dravis.samantha@epa.gov

Ms. Samantha K. Dravis, Regulatory Reform Officer
Associate Administrator for Policy
U.S. Environmental Protection Agency
William Jefferson Clinton Building
1200 Pennsylvania Avenue, NW
Mail Code 1804-A
Washington, DC 20460

Comments to Docket ID No. EPA-HQ-OA-2017-0190, Evaluation of Existing Regulations

Dear Ms. Dravis:

The National Waste & Recycling Association ("NWRA"), the Solid Waste Association of North America ("SWANA"), Waste Management, Inc. ("WM"), and Republic Services (collectively, the "Solid Waste Working Group" or "Working Group") appreciate the opportunity to provide input to the Agency on "Evaluation of Existing Regulations," 82 Fed. Reg. 17793 (April 13, 2017) to identify regulations that are appropriate for repeal, replacement or modification under Executive Order 13777, "Enforcing the Regulatory Reform Agenda."

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In particular, we ask EPA to review the New Source Performance Standards ("NSPS") and Emission Guidelines for Municipal Solid Waste ("MSW") Landfills (the "Landfill Air Rules"). The United States Environmental Protection Agency ("EPA" or the "Agency") has adopted two versions of those two rules—one in 1996 ("Subparts WWW and Cc" or the "1996 Rules")[1] and one in 2016 ("Subparts XXX and Cc" or the "2016 Rules").[2] **Based on our analysis of the rules and evaluation criteria, we strongly urge the Agency to administratively stay the 2016 Rules, and undertake rulemaking actions to address problematic provisions and evaluate cost-effective reforms.** These comments are consistent with our petition for Rulemaking, Reconsideration, and Administrative Stay of the 2016 Rules, submitted to EPA on October 27, 2016 (the "Administrative Petition"), which remains pending.[3] In addition, we ask EPA to review the 1996 Rules alongside the review of the 2016 Rules that is now required by executive order. Only through reviewing all of the Landfill Air Rules together will EPA and the industry be able to craft a reasonable set of regulations to protect human health and the environment while minimizing regulatory burden and cost.

The Solid Waste Working Group represents a broad base of the waste management sector, with NWRA as the leading trade association, and SWANA as the leading professional association for public and private waste management officials in the sector. WM and Republic are leading waste service providers, with over 400 active MSW landfills between them, many of which have been subject to the Landfill Air Rules, as well as the *National Emission Standards for Hazardous Air Pollutants* at 40 C.F.R. Part 63, Subpart AAAA (the "Landfill NESHAP"). The members of the Working Group have gained over two decades of valuable insight and experience in complying with those rules. Further, the members of the Working Group have actively engaged with EPA in the implementation of the rules, working closely with EPA's Office of Air Quality, Planning and Standards personnel for over a decade to accomplish necessary revisions and clarifications to the rules. The members of the Working Group commented extensively on rulemaking proposals published in 2002 and 2006, and more recently in 2014 and 2015.[4]

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[1] 40 C.F.R. Part 60, Subparts WWW & Cc. *See also* 40 C.F.R. Part 62, Subpart GGG (EPA's Federal Plan implementing the MSW Landfill emission guidelines).

[2] 40 C.F.R. Part 60 Subparts XXX & Cf; *see also "Standards of Performance for Municipal Solid Waste Landfills,"* 81 Fed. Reg. 59332-59384 (Aug. 29, 2016); and *"Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills,"* 81 Fed. Reg. 59276-59330 (Aug. 29, 2016).

[3] Petition for Rulemaking, Reconsideration, and Administrative Stay (Oct. 27, 2016) (filed by NWRA, SWANA, Republic Services, WM, and Waste Management Disposal Services of Pennsylvania, Inc.).

[4] *See* NWRA & SWANA Comments on 2014 Proposal, EPA-HQ-OAR-2003-0215-0108 & EPA-HQ-OAR-2014-0451-0062 and Comments on 2015 Supplemental Proposal, EPA-HQ-OAR-2003-0215-0196 & EPA-HQ-OAR-2014-0451-0186; Republic Services, Comments on Proposed Standards of Performance for Municipal Solid Waste Landfills, EPA-HQ-OAR-2003-0215-0099, Comments on Supplemental Proposal, EPA-HQ-OAR-2003-0215-0202, Comments on the Advanced Notice of Proposed Ruling Making for Emission Guidelines, EPA-HQ-OAR-2014-0451-0061, and Comments on Proposed Rules; Emission Guidelines, EPA-HQ-OAR-2014-0451-0176; Waste Management, Inc., Comments on 2014 Proposal, EPA-HQ-OAR-2003-0215-0100 and Comments on 2015 Supplemental Proposal, EPA-HQ-OAR-2003-0215-0198 & EPA-HQ-OAR-2014-0451-0192. Additionally, members of the Working Group provided supplemental information at EPA-HQ-OAR-2003-0215-0003, EPA-HQ-OAR-2003-0215-0007, EPA-HQ-OAR-2003-0215-0053, EPA-HQ-OAR-2003-0215-0055, EPA-HQ-OAR-2003-0215-0057, & EPA-HQ-OAR-2003-0215-0058.

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Although the Working Group supports EPA's regulatory reform efforts, we are not seeking a complete repeal of all regulations governing the control and management of MSW landfill gas. On the contrary, the members of the Working Group view proper landfill gas management as a fundamental requirement of providing competent and reliable waste management services and have a strong commitment to environmental stewardship and full regulatory compliance, as illustrated by the success of the industry in reducing landfill gas emissions substantially and continuously for many decades. In short, we recognize the necessity of regulation, but support EPA's effort to ensure all regulations are, indeed, necessary.

We believe that the Landfill Air Rules present significant opportunities for regulatory reform, consistent with EPA's request for information and Executive Order 13777, because they are confusing, inconsistent, unnecessarily burdensome, impose costs far greater than benefits, and are based on Executive actions that have been repealed. Although EPA determined that the best system of emission reduction ("BSER") underlying the rules had not changed, EPA nevertheless inappropriately finalized more stringent compliance obligations for both new and existing sources in accordance with President Obama's now-rescinded Climate Action Plan and strategy to Reduce Methane Emissions.[5] Further, EPA justified the new, more stringent standards using the Social Cost of Carbon and Methane, which no longer represents an authorized policy for regulatory decision-making. The 2016 Rules also fail to include reasonable streamlining provisions that the industry and EPA have worked cooperatively over many years to address a variety of concerns identified in the 1996 Rules.

For these reasons, as further discussed below, we believe that the best means of remedying the significant flaws and reforming the Landfill Air Rules is an immediate administrative stay of the 2016 Rules, and an Agency commitment to a new rulemaking process. We look forward to working with EPA in developing the revisions needed to ensure the regulations governing the control of landfill gas are appropriate, regular, and effective.

A. The 2016 Rules Derive From and Implement Executive Orders and Presidential Directives That Have Been Rescinded.

The 2016 Rules—Subparts XXX and Cf—must be repealed, replaced, or modified because the rules are based in substantial part on three Obama-era executive actions that have been rescinded by President Trump, including: (1) President Obama's Climate Action Plan,[6] (2) President Obama's Methane Strategy,[7] and (3) the Social Cost of Methane.[8]

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[5] Climate Action Plan-Strategy to Reduce Methane Emissions, March 2014, at 5.
[6] "The President's Climate Action Plan," Executive Office of the President, June 2013 (*https://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf*).
[7] "Climate Action Plan Strategy to Reduce Methane," Executive Office of the President, March 2014 (*https://www.whitehouse.gov/sites/default/files/strategy_to_reduce_methane_emissions_2014-03-28_final.pdf*).
[8] Social Cost of CH_4, Marten et al. (2014).

When finalizing the 2016 Rules, EPA stated that the rules are "consistent with the President's 2013 Climate Action Plan" and "the President's Methane Strategy" and that the rules are "an important element of the United States' work to reduce emissions that are contributing to climate change."[9] As discussed in greater detail below, EPA was not required to modify or revise the Landfill Air Rules, but did so anyway in order to advance President Obama's climate policies. Furthermore, in justifying the costs of EPA's burdensome and unnecessary revisions to the Landfill Air Rules, EPA quantified the supposed benefits of its 2016 Rules by relying on the Social Cost of Methane, without which the Agency could not have justified the costs of the rules.

On March 28, 2017, President Trump signed the "Presidential Executive Order on Promoting Energy Independence and Economic Growth," E.O. 13783. Executive Order 13783 revokes several earlier climate-related Executive actions, including the Climate Action Plan and the Methane Strategy.[10] Furthermore, the Executive Order withdraws the use of the Social Cost of Methane for regulatory decision making and declares that the framework "is no longer representative of government policy."[11] Because the Executive Order has revoked the climate-related policies that serve as the basis for EPA's 2016 Rules, EPA should immediately suspend the rules and promptly convene a proceeding to review and revise them.

B. The 2016 Rules Are Unnecessary and Ineffective.

The 2016 Rules are unnecessary or ineffective regulations that are appropriate candidates for repeal, replacement, or modification because: (1) they increased the stringency of existing Clean Air Act ("CAA") Section 111 standards governing MSW landfills based on the directives contained in President Obama's now-rescinded Climate Action Plan and Methane Strategy, rather than on any statutory mandate to do so; and (2) many aspects of the 2016 Rules have added significant compliance burdens to the existing standards, creating inconsistent, inappropriate, or unworkable conditions for regulated MSW landfills.

1. The 2016 Rules Unnecessarily Reduced the NMOC Emission Threshold.

Since 1996, MSW landfills have been subject to standards promulgated under Sections 111(b) and 111(d) of the CAA: the Standards of Performance for Municipal Solid Waste Landfills set forth at 40 C.F.R. Part 60, Subpart WWW governing new sources; and the Emission Guidelines and Compliance Times for Existing Municipal Solid Waste Landfills set forth at 40 C.F.R. Part 60, Subpart Cc governing existing sources. The primary compliance mechanism under the 1996 Rules was the installation and operation of a gas collection and control system ("GCCS") for landfills that meet certain size and non-methane organic compound ("NMOC")

[9] 81 Fed. Reg. at 59333;81 Fed. Reg. at 59277.
[10] E.O. 13783, Section 3.
[11] *Id.* at Section 5.

emission rate thresholds. In 2003, EPA promulgated the Landfill NESHAP under Section 112 of the CAA, which references and requires compliance with the substantive requirements of the 1996 Rules (Subparts WWW and Cc). Through the obligation to install and maintain a GCCS, the 1996 Rules and the Landfill NESHAP have been largely effective at controlling emissions from MSW landfills, reducing emissions substantially and continuously for two decades.

EPA promulgated Subpart XXX in 2016 pursuant to CAA Section 111(b), governing new sources, which requires EPA to review each NSPS once every eight years.[12] After concluding such review, EPA is not required to revise an NSPS unless the Agency determines that it is appropriate to do so. Even as it adopted the new 2016 Rules, EPA acknowledged that the 1996 Rules already effectively controlled landfill gas emissions. For example, in the preamble to EPA's 2014 proposal, EPA stated that a well-designed and well-maintained GCCS remains BSER for MSW landfills and observed that the obligations in the 1996 Rules concerning operation of a GCCS "continue to ***ensure that the collection system efficiently collects landfill gas.***"[13] EPA further noted that the GCCS design and operation standards in the 1996 Rules remain "the best format" for regulating air emissions from MSW landfills.[14] Despite conceding that the regulatory framework in the 1996 Rules continues to be appropriate and that the GCCS requirement remains BSER for the landfill sector, EPA nevertheless decided to promulgate the 2016 Rules, reducing the NMOC emission threshold for installing a GCCS from 50 Mg/year to 34 Mg/year. EPA cited President Obama's Climate Action Plan and Methane Reduction Strategy as an important impetus for these reductions.

Likewise, with the promulgation of Subpart Cf, EPA determined to increase the stringency of requirements governing existing MSW landfills under Section 111(d) of the Clean Air Act, despite any authority in that section to do so, and despite the Agency's determination that the 1996 Rules continue to reflect BSER. Unlike CAA Section 111(b) governing new sources, CAA Section 111(d) does not permit EPA to review and revise Emission Guidelines applicable to existing sources.[15] In promulgating Subpart Cf, EPA claimed that the Agency has "discretion to [conduct a review of Emission Guidelines] when circumstances indicate that it is appropriate."[16] Until the promulgation of the 2016 Rules, however, EPA had never before revised and tightened already existing final Emission Guidelines published under CAA Section 111(d). As a direct result of EPA's unprecedented action, existing sources with emissions below the 50 Mg/yr threshold may now be required to add controls that they had not planned for and that would not have been required under the 1996 Rules.

EPA justified the costs of installing a GCCS at a lower NMOC threshold on the basis that "substantial reduction in emissions of landfill gas and its constituent components, ***including***

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[12] 42 U.S.C. § 7411(b).
[13] *Standards of Performance for Municipal Solid Waste Landfills*; Proposed Rule, 79 Fed. Reg. 41796, 41802 (July 17, 2014).
[14] *Id.* at 41802.
[15] *Compare* 42 U.S.C. § 7411(b) and 7411(d).
[16] 81 Fed. Reg. at 59277.

methane, will result."[17] According to EPA, further reductions of methane emissions (which is not the regulated pollutant under the rules) is important because "MSW landfills continue [ ] to be the third-largest source of methane emissions in the U.S.," which represents "1.9 percent of total U.S. GHG emissions in carbon dioxide equivalent."[18] It is "***[f]or these reasons . . . EPA is finalizing changes to the Emission Guidelines***."[19] If the Agency's motivations were in doubt, the next five pages of the Subpart Cf Preamble discuss climate impacts associated with methane emissions, while the public health effects associated with NMOC emissions – the regulated pollutant under these rules – are limited to a single paragraph of discussion.[20]

Finally, after essentially conceding that the 2016 Rules were adopted only to advance the Climate Action Plan and Methane Reduction Strategy, EPA justified the costs associated with the NMOC emission threshold primarily by relying on the now-rescinded Social Cost of Methane, which purports to quantify the climate-related benefits of methane reduction. This controversial and unproven metric, derived from the Agency's Social Cost of Carbon framework, far overstated the benefits of reducing the NMOC emission rate trigger for the GCCS requirement. As discussed in greater detail in Section E, below, EPA cannot justify the costs of the 2016 Rules without the Social Cost of Methane, and should therefore restore the NMOC emission threshold to 50 Mg/yr.

2. <u>The Landfill Air Rules Are Ineffective.</u>

In its preamble to the final 2016 Rules, EPA noted that one basis for promulgating the rules was the need for clarification of certain aspects of the 1996 Rules.[21] Indeed, over the past decade, many stakeholders, including members of the Working Group, have worked with EPA to identify necessary revisions and clarifications to the 1996 Rules.[22] With the proposed issuance of revised Landfill Air Rules, we were hopeful that EPA would improve the rules in a manner that provides clear and achievable compliance expectations for the regulated community. Instead, some of the provisions in the 2016 Rules actually exacerbate or simply fail to address many of the problems that regulated landfills faced under the 1996 Rules. A comprehensive discussion of some of the major problems with new 2016 Rules can be found in the Working Group's Administrative Petition.

Rather than highlight the many issues in the rules that are in dire need of correction, the remainder of this section focuses on provisions in the 2016 Rules that relate to approval of GCCS design plans, wellhead monitoring parameters, and corrective action procedures. These

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[17] *Id.* at 59278.
[18] *Id.* at 59281.
[19] 81 Fed. Reg. 59281.
[20] *See id.* at 59282-59287.
[21] 81 Fed. Reg. at 59333.
[22] For a discussion of the numerous issues that stakeholders worked to address with EPA since the issuance of the 1996 Rules, we refer EPA to the submissions referenced in footnotes 3 and 4 above, and incorporated fully by reference into this letter.

issues are among the most significant problems that stakeholders have identified for EPA over the course of two decades of implementing the 1996 Rules and demonstrate that the 2016 Rules are ineffective at addressing these issues.

a. Gas Collection and Control System (GCCS) Design Plan

Given the site-specific nature of landfills, each owner/operator is required to prepare a GCCS design plan that applies the collection and control requirements to the unique circumstances presented at each landfill. A GCCS design plan, prepared with the assistance of a licensed, third-party professional engineer, essentially operates as a landfill's user manual, specifying how the GCCS should operate, and is therefore the primary means for complying with the Landfill Air Rules. Under the 1996 Rules, landfills experienced a very low rate of agency review and approval of GCCS design plans, including alternatives to the design standards and operating parameters, leaving many facilities without any certainty as to whether the GCCS design plan requirements were met or whether their alternatives are appropriate. Presumably to correct these issues, EPA solicited comments on streamlining the GCCS design plan approval process. Rather than make improvements to the rules, however, the 2016 Rules ***have significantly worsened the compliance uncertainty associated with GCCS design plan review and approval***.

For example, the 2016 Rules require that each GCCS design plan be approved, but leaves the decision to review a submitted design plan entirely to the discretion of EPA or the delegated state authority.[23] EPA has thus created a system by which a landfill owner/operator is required to submit a GCCS design plan for agency approval, but neither EPA nor its state or local counterparts are held accountable for actually reviewing and approving, or disapproving, those plans.

This uncertainty is compounded by the failure of the 2016 Rules to provide clarity on whether landfills must proceed with installation of a GCCS without agency approval. For example, the rules state that without having obtained approval, a landfill *may* continue with implementation of the design plan, recognizing that they would "be proceeding at their own risk."[24] This permissive and unprecedented language fails to inform the regulated entity what it should or must do when the relevant agency has not provided approval, and is directly at odds with other provisions in the rules that expressly require actions to be taken in accordance with an approved design plan.[25]

Further, the 2016 Rules do not suspend a landfill's compliance obligations pending design plan approval, including the obligation to seek applicable permits, award contracts, and

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[23] *See* 40 C.F.R. §§ 60.767(c)(5)-(6) & 60.38f(d)(5)-(6).
[24] 40 C.F.R. § 60.767(c)(6); 40 C.F.R. § 60.38f(d)(5) and (6).
[25] 40 C.F.R. § 60.765(b) ("each owner or operator of a controlled landfill must place each well or design component as specified in the ***approved*** design plan").

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install and start up a GCCS within 30 months of the regulatory trigger. The net result of the revised design plan approval process is a Kafkaesque choice for landfill owners/operators: face potential enforcement risk for missing the 30-month compliance deadline in the rules, or face potential financial *and* enforcement risk for installing and operating a multi-million-dollar gas collection system in accordance with a design plan that may later be disapproved.

The 2016 Rules create even further confusion by concluding the design plan approval process with the following statement:

> In the event that the design plan is required to be modified to obtain approval, the owner or operator must take any steps necessary to conform any prior actions to the approved design plan and any failure to do so could result in an enforcement action.[26]

This unintelligible language does not explain how "prior actions" can be conformed to a newly imposed requirement and does not state whether the resulting enforcement risk is retroactive, prospective, or both. Furthermore, it makes clear that EPA did not consider the significant financial risks associated with installing a multi-million dollar gas collection system pursuant to a plan that may later be deemed insufficient. This risk is particularly acute for landfills that need alternative designs to operate a GCCS, given that alternatives must be approved by the relevant agency.

Thus, the 2016 Rules fail to provide the essential regulatory element of fair and timely notice of compliance obligations and therefore must be revised to provide certainty to regulated landfills. The Working Group suggests that EPA eliminate the need for agency review and approval of GCCS plans, which is a system that has simply not worked to date. Instead, we recommend that delegated authorities should be allowed to rely upon a licensed, third-party professional engineer's certification of design plans and revisions in lieu of an agency review and approval process, with certified plans maintained onsite for inspection and/or submittal to the implementing agency, consistent with other standards adopted by EPA.[27] In the event EPA continues to believe that design plan review and approval is necessary, we ask the Agency to consider a defined timeframe for such review and a deemed approval in the event that the reviewing agency fails to respond in a timely manner.

b. Temperature Well-Head Parameter

The 1996 Rules require landfills to conduct regular monitoring to verify that each GCCS wellhead meets certain operating parameters, including limits for pressure, temperature, and either oxygen or nitrogen. In working with EPA on improvements to the 1996 Rules, members

[26] 40 C.F.R. § 60.767(c)(5) and 40 C.F.R § 38f(d)(5).

[27] The Working Group identified 62 other CAA rules with similar provisions in the supplemental comments cited in footnote 4, above.

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of the Working Group expressed their concerns that the temperature and oxygen/nitrogen wellhead monitoring parameters are counterproductive to optimal operation of a GCCS. In response to these concerns, EPA proposed to eliminate both the oxygen/nitrogen parameter and the temperature parameter. We submitted comments supporting EPA's proposal because it recognized that the parameters are not good indicators of a well-functioning GCCS. Unfortunately, EPA retained the temperature parameter in the 2016 Rules and only eliminated the oxygen/nitrogen parameter.

Although the Working Group appreciates EPA's decision to remove from the 2016 Rules the oxygen/nitrogen parameter, nearly two decades of experience implementing the rules has demonstrated that the temperature parameter is a poor indicator of landfill fires or inhibited waste decomposition. To comply with this arbitrary temperature parameter, sites must often reduce landfill gas flow to the affected well, thereby decreasing system performance and ***potentially increasing emissions***. Furthermore, conforming operations to satisfy the temperature parameter imposes significant administrative burdens on both regulatory agencies and the regulated community. The Preambles to the 2016 Rules claim that EPA retained the temperature parameter because of concerns raised by commenters about landfill fires. Wellhead temperature values, however, are not an indicator of GCCS performance or landfill fires. Given that wellhead temperature is not a good indicator of system performance, EPA should eliminate it from the Landfill Air Rules.

c. Corrective Action Procedures

The 1996 Rules require landfills to take corrective actions when exceedances of wellhead operating parameters are discovered. Under those rules, corrective actions must be completed within 15 days, and an alternative timeline prepared if that schedule cannot be met. Under the 1996 Rules, a landfill is not required to obtain agency approval for alternative timelines that do not exceed 120 days. Nonetheless, inconsistent implementation of these requirements by states and EPA regions led to confusion and unanswered alternative timeline requests. Despite EPA's goal to clarify these procedures, the corrective action procedures in the 2016 Rules, much like the design plan procedures discussed above, have become more complicated and leave regulated landfills subject to increased compliance burden and even greater uncertainty.

The corrective action schedule in the 2016 Rules is far more complex, requiring a root cause analysis and submission of a corrective action plan to the relevant agency for review and approval if certain stringent timeframes cannot be met. For example, under the 2016 Rules, a corrective action must be taken within five days of an exceedance of a wellhead parameter. If a corrective action cannot be completed within 15 calendar days of the first measured exceedance, the owner/operator is required to "conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after" the exceedance was

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measured.[28] For any corrective action that is not completed within 60 days, the owner/operator must notify EPA "as soon as practicable but no later than 75 days" after measuring the exceedance.[29] If the owner/operator expects the corrective action to take longer than 120 days to complete, the owner/operator must submit to EPA all of the following: (1) the root cause analysis; (2) the corrective action analysis; and (3) a corresponding implementation timeline.[30] These materials must be submitted "as soon as practicable, but not later than 75 days after the first" measured exceedance.[31] The Administrator "must approve the plan for corrective action and the corresponding timeline."[32] These procedures are highly complicated, overly burdensome, and like the design plan procedures, do not require agencies to respond to such submittals.

Because these new procedures significantly increase administrative burdens for both affected facilities and agencies, EPA must simplify the corrective action procedures in the Landfill Air Rules. The Working Group suggests that EPA eliminate the approval process for alternative corrective action procedures and timeframes altogether. This approach would be consistent with 40 C.F.R. Part 60, Subpart Ja (NSPS for petroleum refineries), which obligates sources to conduct root cause analyses but does not require agency approval of corrective actions.

C. The 2016 Rules Create a Serious Inconsistency and Interfere with Regulatory Reform Initiatives and Policies.

In promulgating the 2016 Rules without terminating the applicability of the 1996 Rules, the Agency has created an unintelligible web of regulation that now imposes two inconsistent standards on every landfill. In addition, the 2016 Rules ignore efforts made over many years by EPA and the solid waste industry to streamline the 1996 Rules, and instead render the rules more stringent based solely on the now-rescinded Climate Action Plan and Methane Reduction Strategy. These concerns likewise justify a full review of the Landfill Air Rules under Executive Order 13777.

1. The Landfill Air Rules Impose Inconsistent Requirements on All Landfills.

In the 2016 Rules, EPA adopted applicability provisions that fail to consider the applicability provisions of the 1996 Rules. EPA also failed to consider the Landfill NESHAP, which requires compliance with either Subparts WWW or Cc of the 1996 Rules. In its rule preamble, EPA acknowledged that the "updates" and "revisions" that it intended to make could have been adopted within the existing Subparts WWW and Cc by updating and revising those

[28] 40 C.F.R. § 60.765(a)(3)(i) & (5)(i) & 40 C.F.R. § 60.36f(a)(3)(i) & (5)(i).
[29] 40 C.F.R. § 60.767(j)(2) & 40 C.F.R. § 60.38f(k)(2).
[30] 40 C.F.R. § 60.765(a)(3)(iii) & (5)(iii) & 40 C.F.R. § 60.36f(a)(3)(iii) & (5)(iii).
[31] 40 C.F.R. § 60.767(j)(1) & 40 C.F.R. § 60.38f(k)(1).
[32] *Id.*

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subparts.[33] Instead, EPA forged a more complicated path by promulgating two entirely new subparts—Subparts XXX and Cf. Thus, the applicability provisions for all five rules (the 1996 and 2016 versions of the NSPS and EG, plus the landfill NESHAP) are now codified as follows:

- **Subpart Cc:** landfills constructed / modified "before May 30, 1991"[34]
- **Subpart WWW:** landfills constructed / modified "on or after May 30, 1991"[35]
- **Subpart Cf:** landfills constructed / modified "on or before July 17, 2014"[36]
- **Subpart XXX:** landfills constructed / modified "after July 17, 2014"[37]
- **Subpart AAAA:** landfills that are major sources or area sources meeting certain design capacity thresholds must comply with WWW or Cc[38]

Because of these overlapping applicability provisions, every single landfill in the country will necessarily meet the applicability criteria of two inconsistent subparts—one from 1996, and one from 2016—as illustrated in the table provided below:

Landfills that were last constructed / modified…	Emission Guidelines for 111(d) "Existing Sources"		NSPS for 111(b) "New Sources"	
	Cc (1996)	Cf (2016)	WWW (1996)	XXX (2016)
… before May 30, 1991	✖	✖		
… on or between May 30, 1991 & July 17, 2014		✖	✖	
… after July 17, 2014			✖	✖

This overlapping applicability is unreasonable because it would require landfills to simultaneously comply with different and overlapping provisions from both the 1996 and 2016 Rules. In doing so, EPA is forcing landfills to meet all provisions of the 2016 Rules without allowing landfills to benefit from the regulatory provisions that EPA intended to update and streamline, since the 1996 Rules still apply as originally adopted. As just one example, EPA eliminated the oxygen parameter as a basis for requiring corrective action in the 2016 Rules, but the 1996 Rules continue to require all landfills to take corrective action for any oxygen exceedances.

[33] *See* 81 Fed. Reg. at 59333, FN 3.
[34] 40 C.F.R. § 60.32c.
[35] 40 C.F.R. § 60.750.
[36] 40 C.F.R. § 60.31f.
[37] 40 C.F.R. § 60.760.
[38] 40 C.F.R. §§ 63.1935; 63.1955.

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These overlapping applicability provisions also contravene the CAA because they have the effect of simultaneously regulating most landfills—those last modified between 1991 and 2014—as both "new" landfills subject to an NSPS and "existing" landfills subject to an emission guideline. That result is not only logically inconsistent, but prohibited by the CAA, which defines the two terms "new source" and "existing source" in mutually exclusive fashion[39] and establishes separate programs for "new" and "existing" sources (Section 111(b) for new sources, and Section 111(d) for existing sources).

EPA's own statements confirm that the Agency did not intend for landfills to comply with both the 1996 Rules and 2016 Rules simultaneously. The most obvious indication of EPA's intent is the reference to the 2016 Rules as a "revision," "update," or "changes" to the 1996 Rules.[40] However, EPA's failure to enact appropriate applicability provisions in the 2016 Rules renders them inconsistent with the 1996 Rules that still apply. Landfills are thus left with a set of regulations unlike any EPA has ever imposed on any industry. All of the other NSPS revisions that EPA has ever adopted make clear that only one NSPS subpart should apply at a time (and EPA has never before revised an emission guideline). For example, when EPA revised the standard for stationary combustion turbines by adopting a new Subpart KKKK, EPA confirmed that sources subject to that new subpart would be "exempt" from the provisions of the pre-existing requirements of Subpart GG.[41] Similarly, after EPA adopted a new standard in Subpart Da for fossil fuel-fired steam generators, EPA revised the old Subpart D to make clear that any facility subject to the new standard "is not subject" to the old standard.[42] Many other subparts contain language of similar effect to avoid the overlap of pre-existing and newly revised standards.[43]

Due to the serious regulatory inconsistencies that EPA created in 2016 when it adopted different requirements in new Subparts XXX and Cc without terminating the applicability of the 1996 Rules, the 2016 Rules easily qualify as rules that contain severe inconsistencies, which must be reviewed under Executive Order 13777.

2. The Landfill Air Rules Interfere with Decade-Long Efforts to Reform the MSW Landfill NSPS and Emission Guidelines.

Executive Order 13777 also requires the review of rules that "otherwise interfere with regulatory reform initiatives and policies." The 2016 Rules meet that criterion because they interfere with and ignore numerous streamlining provisions that EPA and the landfill industry

[39] The CAA defines "existing source" as "any stationary source other than a new source." 42 U.S.C. §7411(a)(6).
[40] *See e.g.*, 81 Fed. Reg. at 59276 ("Based on this review, the EPA has determined that it is appropriate to revise the Emission Guidelines.").
[41] 40 C.F.R. § 60.4305 ("Stationary combustion turbines regulated under this subpart [KKKK] are exempt from the requirements of subpart GG of this part.").
[42] 40 C.F.R. § 60.40 ("Any facility subject to . . . subpart Da . . . of this part is not subject to this subpart.").
[43] *See, e.g.*, 40 C.F.R. Part 60, Subparts Ea, Eb, K, Ka, Kb, AA, AAa, J, Ja, VV, VVa, GGG, GGGa, AAAA, BBBB, CCCC, DDDD, EEEE, & FFFF.

had developed over many years. Efforts at streamlining the 1996 Rules began in 2002—fifteen years ago—based on a shared concern and understanding that the 1996 Rules were unnecessarily burdensome in several ways. For example, at various points in the rule development process, both EPA and the industry agreed that the corrective action requirements for any exceedances of an oxygen or temperature wellhead parameter were not only unnecessary, but potentially counter-productive to effective landfill gas control.

However, in the 2016 Rules, EPA ignored many of the streamlining provisions it had previously considered and evaluated with input from the solid waste sector, and instead focused primarily on implementing President Obama's Climate Action Plan and Methane Reduction Strategy. As a result, the 2016 Rules became more onerous than the 1996 Rules, not less. In addition, it appears many of the streamlining provisions were dropped or significantly altered at the last moment in the rulemaking process, long after they had been proposed and supported by many favorable comments. For example, even though EPA had proposed to eliminate from the 1996 Rules the requirement for corrective action following exceedances of an arbitrary temperature parameter, the final 2016 Rules retained that requirement.

Since the 2016 Rules failed to include important revisions needed to correct various flaws in the 1996 Rules, the 2016 Rules interfered with the efforts at reforming those rules. Therefore, the 2016 Rules must be reviewed under Executive Order 13777, and EPA should initiate a new review of the 1996 Rules to make the reforms needed to minimize the regulatory burdens they impose.

D. The Data Underpinning the Reduced NMOC Threshold, the Wellhead Temperature Operating Standard, and the Tier 4 Wind Speed Restrictions do not meet Federal Requirements for Transparency or Reproducibility.

1. NMOC Threshold

EPA provided no technical or scientific justification for finalizing the reduced NMOC regulatory standard of 34 Mg/year in the 2016 Rules. EPA provided no substantiation that the original requirement to install landfill gas controls where NMOC emissions exceeded 50 Mg/year, as required by the 1996 Rules, is no longer appropriate. In reviewing the technical, policy and economic materials in the rulemaking docket, the Working Group was unable to obtain the underlying data supporting EPA's decision to lower the NMOC threshold, and we were unable to reproduce the Agency's analysis. Our comments on the proposed rules described our concerns in detail.[44] EPA responded by indicating that it provided technical justification for lowering the NMOC threshold in the rule preambles, but the Agency did not respond to the concerns about lack of transparency, access to data, or problems with reproducibility of their analysis and conclusions.

[44] *See* EPA-HQ-OAR-2003-0215-0099.1 (comment excerpt 20, and comment response).

We were not alone in criticizing the lack of robust and transparent data underpinning the rulemakings. In their Petition for Reconsideration, Sierra Club, Friends of the Earth, Institute for Local Self-Reliance and Center for a Competitive Waste Industry wrote,

> The underlying documentation used in the development of the rule that was released online with the Federal Register notices did not provide sufficient detail to replicate the calculation of the methane reductions attributed to the rule change claimed by EPA.[45]

And further,

> Petitioners disputed EPA's claimed methane reductions in part on the basis that the documentation was too obscure to make it possible for anyone else to replicate the calculations, which is a necessary step to validate the claimed emission reductions.[46]

EPA itself described the lack of robust data used in assessing potential emissions reductions in the preamble to the final Emission Guidelines Rule:

> With the data available, we are not able to provide health benefit estimates for the reduction in exposure to HAP, ozone, and PM2.5 for this rule. This is not to imply that there are no such benefits of the rule; rather, it is a reflection of the difficulties in modeling the direct and indirect impacts of the reductions in emissions for this sector with the data currently available.[47]

Without having otherwise justified the revisions to the rules, EPA relied heavily on the President's Climate Action Plan, Methane Strategy, and Social Cost of Methane to rationalize the increased costs of the lowered standard in the 2016 Rules; however, these documents have been rescinded.

Furthermore, the Agency's regulatory and cost analysis was based on a total of five modeled landfills to represent landfills opening during 2010-2014, combined with five landfills for which construction was already planned. This led EPA to project 10 future landfills subject to the revised Emission Guidelines. In addition, 11 model landfills were created that would be subject to the NSPS. As Sierra Club et. al further noted:

> However, the models used to calculate the claimed emission reductions remained obscure. No details were provided to explain anything about what those models (or more accurately "surrogates") consisted of or how they were constructed or validated. Nor did EPA state why it did not simply directly calculate the changes in emissions at the

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[45] Petition for Reconsideration by the Sierra Club, Friends of the Earth, Institute For Local Self-Reliance And Center For a Competitive Waste Industry, at 4 (Oct. 29, 2016) (the "Sierra Club Petition").
[46] *Id.* at 4-5.
[47] 81 Fed. Reg. at 59280.

landfills it said it had identified as being affected by the rules, rather than resorting to inapposite, and nontransparent "surrogates."[48]

2. Wellhead Temperature Operating Standard

In the 2015 Supplemental Proposal for the NSPS, EPA proposed to remove the operational standards for temperature and nitrogen/oxygen from the 1996 Rules, but would still have required monthly monitoring for the parameters. The Working Group commented favorably on EPA's proposal and stated that by removing these parameters, EPA would be eliminating the most significant barriers to installation of interim gas control measures. The Working Group also commented that the parameters often required landfill owner/operators to request higher operating values ("HOVs"), the granting of which created administrative burdens for state regulators and the industry, and the requests were often delayed or refused by state agencies due to lack of expert resources.

EPA asserted in the preambles of the final 2016 Rules that the reason the temperature parameter was retained is due to EPA's concerns about landfill fires. However, the Working Group submitted lengthy comments demonstrating that the 55-degree Celsius wellhead operating parameter is an arbitrary limit that is unrelated to landfill fires or anaerobic decomposition. Although EPA acknowledged the comments as a rationale for eliminating the temperature limit from the 1996 Rules, the Agency reversed course in the final 2016 Rules with little explanation beyond citing in a footnote a study entitled "Subsurface Heating Events at Solid Waste and Construction and Demolition Debris Landfills: Best Management Practices."[49] An assessment of the study was not available in the docket, nor did EPA explain how the study supported the Agency's decision to reverse course in the 2016 Rules.

Further, there is nothing in the record or docket to support setting a temperature standard and EPA did not provide a valid reason for deviating from its proposal to eliminate the temperature well-head parameter. In fact, the temperature parameter undercuts EPA's BSER determination for the landfill sector (i.e. a well-designed and well-operated GCCS). As discussed in Section B, above, temperature is an arbitrary parameter that may actually hinder optimal GCCS operation because sources may need to capture less gas in order to avoid exceeding the temperature limit. Given that the temperature parameter contributes to poor operation of a GCCS, EPA must remove the temperature-based corrective action requirements from the Landfill Air Rules.

3. Tier 4 Wind Speed Restrictions

In the 2016 Rules, EPA altered the proposed methodology for conducting Tier 4; *i.e.*, the collection of site-specific data to more precisely determine NMOC emissions for purposes of

[48] Sierra Club Petition, at 4.
[49] 81 Fed. Reg. at 59349, fn 39.

evaluating when a GCCS must be installed. Although the development of a Tier 4 methodology was well received in concept, the final rules included unnecessary and ineffective restrictions on the use of Tier 4. These new requirements rendered the Tier 4 monitoring technically impracticable to implement. EPA proposed to limit the use of Tier 4 when the average wind speed exceeds 5 miles per hour and the instantaneous wind speed exceeds 10 miles per hour.[50] The Working Group, among other commenters, submitted comments urging EPA not to finalize the proposed wind-speed restrictions, which members of the Working Group identified as unsupported by the available science and unduly restrictive.[51] Neither the Working Group nor any other commenters had any opportunity to comment on use of a wind barrier as an alternative to the wind speed restrictions because there was no indication in any of EPA's proposals that would suggest wind barriers were under consideration.

In the Final 2016 Rules, EPA reduced the wind speed restriction from 5 mph to 4 mp and added a new requirement to use a wind barrier.[52] EPA failed to support the wind-speed restrictions with required and relevant analysis, did not undertake to demonstrate that wind barrier technology is available to be implemented at subject landfills, and has greatly underestimated the increased burden such requirements will impose on sites with low site-specific emission rates.

E. The Landfill Air Rules Impose Costs that Exceed Benefits.

Executive Order 13777 requires EPA to review the 2016 Rules because the costs of the rules far exceed their benefits. Not only are the costs far more significant than the benefits, they are also far more real, in that the rules will require existing and new landfills to incur significantly higher operating and compliance expenses. In contrast, EPA has made no effort to explain how the relatively miniscule emission reductions that the rules are intended to achieve will improve the lives of anyone in the real world. Instead, the alleged benefits of the rule are entirely dependent on a speculative and flawed "social cost" analysis that has now been rescinded by Executive Order 13783.[53] Since the real costs far outweigh the essentially non-existent benefits, the 2016 Rules impose an "unnecessary regulatory burden" that EPA must review. In addition, the Working Group asks EPA to review the 1996 Rules alongside the review of the 2016 rules required under Executive Order 13777 because many individual provisions of the 1996 rules likewise impose unnecessary costs.

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[50] *See* 80 Fed. Reg. at 52135-36.
[51] *See* e.g. WM 2015 Comments at 15-16.
[52] 40 C.F.R. §§ 60.764 (a)(6)(iii)(A) & 40 C.F.R. 60.35f(a)(6)(iii)(A).
[53] Note that Executive Order 13783 also expressly requires EPA to "as soon as practicable" suspend, revise, or rescind the Landfill Air Rules because they are related to an arose out of President Obama's Climate Action Plan and Strategy to Reduce Methane Emissions.

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1. The Costs of the 2016 Rules Are Significant and Real.

EPA's own cost estimates confirm that the 2016 Rules represent an "economically significant regulatory action"[54] as defined in Executive Order 12866—*i.e.*, a regulation imposing more than $100 million in cost. Specifically, EPA estimated that the reduction in the NMOC emission rate trigger would require more landfills to install a GCCS, adding $93 million in cost *each year* for existing landfills and $11 million in cost *each year* for new landfills.[55] Although new control installations on lower-emitting landfills are only one possible source of additional costs imposed under the 2016 Rules, these costs alone are significant and confirm that the rules warrant further review. These significant cost increases exacerbate a total regulatory burden already borne by the industry of more than $700 million per year under the 1996 Rules, according to EPA's own estimates.[56]

In addition to more stringent control requirements, the 2016 Rules also impose costly new procedural requirements. EPA estimated the new testing and monitoring costs necessary to comply with the 2016 Rules at around $840,000 for all landfills,[57] but those estimates are woefully low because they only reflect the additional costs for landfills that must install a control system for the first time under the new rules. EPA's estimates thus fail to account for many new requirements that apply to all landfills with a control system, regardless of when it was installed.

The most significant of the new monitoring requirements imposed under the 2016 Rules is the requirement to monitor all cover penetrations quarterly. EPA ignored the costs associated with the new cover penetration monitoring requirement because EPA characterized it as a mere "clarification" of the 1996 Rules, which already require quarterly surface monitoring. However, the 1996 Rules make abundantly clear that penetration monitoring is *only* required where elevated gas concentrations have been observed, not at *every* penetration,[58] and that approach has been standard industry practice for decades. In reality, the new requirement to monitor *all* cover penetrations under the 2016 Rules[59] will likely at least double the quarterly monitoring costs for every landfill in the country. EPA took no account of that significant cost increase in its regulatory impact analyses.

EPA's estimates also take no account of the many new recordkeeping and reporting requirements imposed by the 2016 Rules, including a completely new corrective action root cause analysis procedure. Although EPA may have assumed that these new procedures would

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[54] 81 Fed. Reg. at 59366; 81 Fed. Reg. at 59309.
[55] 81 Fed. Reg. at 59362, Table 2, note e; 81 Fed. Reg. at 59305, Table 2, note e.
[56] *Id.* at Table 2.
[57] *Id.* at Table 2, note e.
[58] 40 C.F.R. § 60.753(d) (requiring monitoring "where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover").
[59] 40 C.F.R. § 60.763(d) (requiring monitoring "where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover and all cover penetrations").

not add significant new costs because they were intended to replace the procedures already required under the 1996 Rules, the 2016 Rules require entirely new records and reports on a entirely different schedule, adding significant cost while providing no additional health or environmental benefits. Further, EPA's failure to terminate the 1996 Rules leaves landfills subject to an overlapping and confusing set of duplicative requirements that exacerbate the costs of the new procedures.

As another example, the 2016 Rules require any landfills that have recirculated liquids to submit an annual report that contains voluminous information about liquids addition practices. However, EPA has conceded that it does not have sufficient information to justify imposing a specific standards on landfills that add liquids,[60] and so the 2016 Rules do not impose any different substantive requirements on such landfills. Thus, EPA has imposed a significant recordkeeping and reporting burden that provides absolutely no real benefit. To the extent EPA wishes to gain a better understanding of how liquids addition may affect emissions, EPA should rely on its information gathering authority, instead of imposing an unjustified compliance obligation under a program that only authorizes EPA to establish standards based on adequately demonstrated control technology and practices.[61]

In its regulatory impact analysis for the 2016 Rules, EPA attempted to offset the increased regulatory burden somewhat by claiming that many landfills newly required to install controls would be able satisfy that requirement by constructing landfill-gas-to-energy projects. EPA assumed that the sale of electricity generated by those projects would provide a revenue stream that would offset the additional regulatory costs associated with the 2016 Rules. However, EPA's assumption is incorrect, in that it fails to recognize that most of the landfills that would be required to control emissions for the first time under the new rules would be lower-emitting landfills that likely would not generate enough landfill gas to make an energy project economically viable. Further, the economics of siting landfill gas-to-energy projects are complicated, require much more gas to be viable than EPA assumes, and often involve third parties that are not governed by the Landfill Air Rules. EPA's assumption that gas-to-energy income would offset increased compliance costs is vastly overstated and oversimplified. Thus, EPA should ignore those purported offsets in evaluating the regulatory burden imposed by the 2016 Rules.

In sum, EPA's own cost estimates for the 2016 Rules, although significant, severely underestimate the real costs that landfills will incur. However, even those underestimated costs significantly outweigh the essentially non-existent benefits of the 2016 Rules, which are briefly described below.

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[60] *See* 81 Fed. Reg. at 59345 & 81 Fed. Reg. at 59289 ("EPA did not receive sufficient data to support a separate subcategory for landfills adding leachate or other liquids.")

[61] *See* 42 U.S.C. § 7411(a) (defining "standards of performance" as those the Administrator has determined to be "adequately demonstrated").

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2. The Alleged Benefits of the 2016 Rules Are Insignificant and Illusory.

Even at face value, the benefits that EPA sought to achieve with the 2016 Rules are minimal. For all of the additional cost imposed by the rules, EPA projected only a three percent reduction in emissions.[62] And, unlike most other significant rules that EPA has adopted in recent years, EPA made no attempt to assign a health-based value to explain how these minor reductions will provide any real health or environmental benefits.

Instead, EPA claimed that "climate benefits" justify the 2016 Rules. However, even after converted to 8.2 million tons per year (tpy) of carbon dioxide equivalent (CO_2e), using a relatively high multiplier for the "global warming potential" of methane, the result remains inconsequential once put into context. Though perhaps a large value in appearance, the promised CO_2e reduction is a small fraction of total landfill methane emissions of 115.7 million tpy CO_2e. The projected reduction appears even smaller when compared to total U.S. methane emissions of 655.7 million tpy CO_2e, largely due to the fact that landfills only account for 17.6 percent of the country's methane emissions (landfills are only the third largest anthropogenic source of methane emissions, behind oil and gas production and enteric fermentation).[63]

The methane reductions that EPA attributed to the 2016 Rules also appear miniscule in comparison to total anthropogenic greenhouse gas (GHG) emissions in the United States. In spite of the higher global warming potential assigned to methane, that pollutant still only accounts for 10 percent of the country's total GHG emissions.[64] As such, the relatively small methane reduction that EPA projected as a result of the 2016 Rules is only a tiny portion of the total U.S. GHG emissions of over 6,500 million tpy CO_2e. Moreover, U.S. GHG emissions are only about 15 percent of total global anthropogenic GHG emissions,[65] which reached 49 gigatons CO_2e in 2010, a massive total that the 2016 Rules could not possibly influence enough to provide actual, real-world benefits to anyone.[66]

In spite of the clear and obvious fact that the GHG emission reductions projected by EPA will not have any real effect on global climate trends, EPA relied on the "social costs" of methane and CO_2 in attempting to justify the 2016 Rules with a monetized value. Specifically, EPA concluded that, based on those "social costs" analyses, the 2016 Rules would provide a net benefit of $390 million and $62 million (for the NSPS and emission guidelines, respectively).[67] In those calculations, EPA even claimed additional benefits based on CO_2 reductions from power plants that have nothing to do with landfills, again based on the false assumption that

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[62] 81 Fed. Reg. at 59362; 81 Fed. Reg. at 59305.
[63] *See* Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2015, at ES-15.
[64] *Id.* at ES-8.
[65] https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data
[66] IPCC, 2014: Summary for Policymakers. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
[67] 81 Fed. Reg. at 59366 (NSPS); 81 Fed. Reg. at 59309 (EG).

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the 2016 Rules would encourage new landfill-gas-to-energy projects, which EPA counted as an offset to overall power plant demand.

In determining whether the 2016 Rules warrant review under Executive Order 13777, EPA should ignore all of these illusory benefit calculations. If nothing else, Executive Order 13783 clearly prohibits EPA from relying on the "social cost" analyses, which should eliminate from consideration all of the benefits that EPA was able to monetize when it adopted the rules. That result is appropriate in light of the many fundamental flaws inherent in the "social cost" analyses, chief among them the unfairness inherent in comparing a short-term U.S. cost estimate to a highly speculative and extraordinarily long-term guess about potential global benefits. And even those "social cost" analyses actually admit that reducing all U.S. GHG emissions to zero "would be far from enough to avoid substantial climate change,"[68] further confirming that the minor reductions required by the 2016 Rules would be meaningless. Although EPA also claimed that the rules would produce some forms of benefits that could not be monetized, the inability to quantify those benefits suggests they must be truly infinitesimal.

3. The 2016 Rules' Real Costs Far Exceed the Alleged Benefits.

All told, the costs of the 2016 Rules are real and significant—at least $100 million by EPA's own estimate, and perhaps many times that amount—while the benefits are essentially zero, given that they are based entirely on a flawed, and now rescinded, "social cost" analysis. Accordingly, the 2016 Rules easily qualify as rules that "impose costs that exceed benefits" and therefore warrant a full review under Executive Order 13777.

4. EPA Should Also Review the Provisions of the 1996 Rules that Impose Costs Greater Than Benefits.

To ensure the 1996 Rules are no more burdensome than necessary to ensure appropriate control of landfill gas, the Working Group asks EPA to review the 1996 Rules alongside the review of the 2016 Rules that is now required by executive order. Only through reviewing all of the Landfill Air Rules together will EPA and the industry be able to work together in crafting a reasonable set of regulations to protect human health and the environment while minimizing regulatory burden and cost.

* * *

The Working Group appreciates your consideration of our comments and recommendations. We look forward to continuing to work with you on the development of regulatory proposals for revising the Landfill Air Rules. If you have any questions, please do not hesitate to contact any of the undersigned Working Group representatives at your earliest convenience.

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[68] Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (revised 2015), at 14.

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To: Dravis, Samantha[dravis.samantha@epa.gov]; Kime, Robin[Kime.Robin@epa.gov]
From: Kelly, Kerry
Sent: Fri 3/24/2017 8:46:42 PM
Subject: FW: Clean Air Act Rules for MSW Landfills
Landfill Air Rules Summary.docx

Dear Samantha and Robin:

I meant to copy you on this email I just sent to George and pressed send too quickly. The attached materials are a follow-up to a conference call the Landfill Sector had with him this Tuesday to discuss recently promulgated Clean Air Act rules. He mentioned his intent to brief you on all of this, but I wanted to keep you in the loop with all our correspondence. If you have any questions, please do not hesitate to call.

I hope we will have the opportunity to meet soon.

Warm regards,

Kerry

Carter Lee "Kerry" Kelly

Senior Director, Federal Affairs

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From: Kelly, Kerry
Sent: Friday, March 24, 2017 3:10 PM
To: Sugiyama, George <sugiyama.george@epa.gov>
Cc: Kelly, Kerry <KKelly5@wm.com>
Subject: Clean Air Act Rules for MSW Landfills

Dear George,

We appreciated the opportunity to talk with you about our concerns with the revised New Source Performance Standards (new Subpart XXX) and Emission Guidelines (new Subpart Cf) for MSW Landfills, promulgated at the end of the Obama Administration as part of its Climate Action Plan. Although EPA determined that the "best system of emissions reduction" remained unchanged, the Agency significantly lowered the regulatory threshold at which controls must be installed for both new and existing sources based solely on estimated GHG benefits premised on the "Social Costs of Methane and Carbon." We believe these rules offer an ideal opportunity for EPA to meet President Trump's directives to reduce regulatory costs through needed rule revisions, and the potential to eliminate two regulations that could serve as an offset for any other EPA regulation.

The attached document summarizes our concerns and our recommendation for an immediate administrative stay of the rules pursuant to CAA Section 307. We believe that this important interim step is the easiest way for the Agency to begin a reconsideration or rulemaking process to correct the rules' deficiencies, while also allowing the states to halt expending precious resources on developing implementation plans. It will also give the Agency time to consider and grant an administrative stay under APA Section 705, while completing a remedial rulemaking process.

We believe time is of the essence. Already we are facing potential compliance risks associated with surprising regulatory interpretations of new Subpart XXX emerging from the Regions that are not based on regulatory text. We hope the attached will provide you with the information you need to set up a meeting with Samantha Dravis, but please do not hesitate to call if we can provide additional explanations. I will call you to follow up on this email.

Warm regards,

Kerry

Carter Lee "Kerry" Kelly

Senior Director, Federal Affairs

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Recycling is a good thing. Please recycle any printed emails.

To: Dravis, Samantha[dravis.samantha@epa.gov]
Cc: Jessica Medeiros Garrison (jgarrison@balch.com)[jgarrison@balch.com]
From: James M. Proctor
Sent: Wed 3/22/2017 9:36:14 PM
Subject: Water infrastructure Policy Book
Water Infrastructure Policy Proposals to Transition Team Final.pdf

Samantha,

Jessica mentioned that you needed another copy of the transition team's policy book on water infrastructure. Attached is an electronic version. I would love to have an opportunity to walk you through it sometime in the next 4-6 weeks so that you are fully up to speed and get answers to any questions. I would also like to discuss how we can help the Administrator achieve his goals on this issue. We have a strong network of water stakeholders who are eager to help.

Thanks for focusing on this. As we have discussed, water presents a great opportunity for Administrator Pruitt to get credit for some positive action.

I look forward to talking with you further.

Jim

James M. Proctor II

Senior Vice President and General Counsel

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205-578-3811

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APPENDIX __

Trump For America
Presidential Transition Team

A Blueprint for a 21st Century Water Infrastructure Policy

Transportation & Infrastructure
Water Policy Implementation Team

Point of Contact:

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Donald J. Trump's Vision:

TIME FRAME	NATURE OF ACTION	ACTION
Day One	Executive Order	• Issue a Presidential Policy Directive for an Integrated and Effective Water Infrastructure Policy and Strategy • Establish Presidential Commission on Water Infrastructure Policy Coordination and Security to: o Review all water infrastructure programs and policies across all federal agencies and departments for consolidation, rationalization, reduction, elimination or modernization o Development of consistent, integrated, and cost-efficient strategic plan and policy for: ▯ Reorganization and streamlining federal water laws and responsibilities ▯ Integrated water source and watershed management and protection to reduce costs of treatment ▯ Integrated water and energy management plan ▯ Water infrastructure funding ▯ Sharing and adoption of best practices among utilities ▯ Security of water infrastructure, including cyber security ▯ Coordination of domestic water policy with international aid programs • Appoint an Assistant to the President for Water Policy and Security • Require and reinforce Buy American for all water programs, including international aid programs
First 100 Days	Executive Order/Policy Directive	• Executive Order to strengthen the cyber security of America's water infrastructure • Mandate all cost-benefit analyses consider opportunity costs incurred because of increased compliance costs • Bolster the U.S. Environmental Export Initiative's focus on promoting the export of U.S. goods and services for water and wastewater • Require full life-cycle costing for bids on federally funded projects, and that bid awards be determined on lowest long-term life-cycle cost • Mandate more rigorous water science and data collection for all new and existing regulations • Deploy the Blue Wave program to build capacity for water and wastewater utilities • Direct DOL to establish a cross-agency program for workforce development within water sector
	Legislative Action	• Ratify Commission on Water Infrastructure Policy Coordination and Security and appropriate funding • Remove cap for private activity bonds for water infrastructure • Appropriate $1 billion of new funding for WIFIA • Appropriate greater of 20% of total infrastructure spending plan or $10 billion of new funding for each of SRFs • Pass permanent Buy American standards for all water programs • Tax credits for service line replacement/filtration programs [Flint issue] • Establish and fund a "National Water Infrastructure Test Bed Network" for water technology verification, that would encourage adoption of emerging cost-saving technologies • Amend the Clean Water Act to improve federal agency coordination and advance integrated water resources management • Reform the Agricultural Act of 2014 to protect water sources by requiring collaboration between ag producers and water systems to reduce degradation of water sources
	Regulatory Action	• Eliminate regulatory barriers to pension fund investments in SRF's • Eliminate barriers to public-private partnerships (P3) investments • Establish standards encouraging use of most resilient and sustainable systems and materials in infrastructure construction, including energy efficiency
First 200 Days	Executive Order	• Improve federal agency collaboration and support for state and local in water quality research, monitoring, and data collection. • Issue an Executive Order to develop a "Knowledge and Information for Customers" (KIC) Lead program • Issue an Executive Order to promote greater water quality trading (WQT)
	Legislative Action	• Create incentives for total-cost accounting for water service and full-cost pricing, with low-income assistance • Modify LIHEAP program to apply to water (LIWAP)
	Regulatory Action	• Enhance Industrial Control Systems Cyber Emergency Response Team to deal with water sector risks
First Year	Executive Order	• Complete a Global Water Strategy by October 2017
	Legislative Action	• Establish a Center for Water Conflict Prevention and Resolution to enhance national security. • Increase investment for improved global access to Water, Sanitation, and Hygiene (WASH)
	Regulatory Action	• Require integrated regional planning for water infrastructure construction and management • Clarify EPA requirements for storm water discharges from municipal water facilities.

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- Transform America's crumbling water infrastructure into a golden opportunity for accelerated economic growth and more rapid productivity gains with a deficit-neutral plan targeting substantial new infrastructure investments.

- Pursue an "America's Water Infrastructure First" policy that supports investments in clean drinking water on a reliable infrastructure grid.

- Provide maximum flexibility to the states.

- Create thousands of new jobs in construction, iron and steel manufacturing, and other sectors to build the water and wastewater infrastructure needed to enable new economic development in the U.S., all of which generate new tax revenues.

- Put American products made by American workers in the backbone of America's water infrastructure.

- Leverage new revenues and work with financing authorities, public-private partnerships, and other prudent funding opportunities.

- Harness market forces to help attract new private infrastructure investments through a deficit-neutral system of infrastructure tax credits.

- Link increases in spending to reforms that streamline permitting and approvals, improve the project delivery system, and cut wasteful spending.

- Employ incentive-based contracting to ensure projects are on time and on budget.

- Approve private sector water infrastructure projects — including pipelines, waterways, and canals — to better connect Americans with clean water.

- Work with Congress to improve our water infrastructure network, end unsafe drinking water, and reform the State Revolving Funds (SRFs), USDA programs, WIFIA and WRRDA, while also ensuring Americans that their water supply is safe.

- Incorporate new technologies and innovations into our national water infrastructure such as state-of-the-art pipelines and advancements in water distribution and conservation.

- Make clean water a high priority. Develop a long-term water infrastructure plan with city, state, and federal leaders to upgrade aging water and wastewater systems. Triple funding for state revolving loan funds programs (SRF's) to help states and local governments upgrade critical drinking water and wastewater infrastructure.

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- Link increased investments with positive reforms to water infrastructure programs that reduce leaking and waste and cut costs. Complete projects faster and at lower costs through significant regulatory reform and ending needless red-tape.

Key Issues

- Water and wastewater infrastructure investment strengthens our economic platform, makes America more competitive, creates thousands of jobs, increases wages for American workers, and reduces the high cost of water for Americans associated with an aging infrastructure.

- America's water and wastewater infrastructure is a linchpin of private sector growth but, today, much of America's drinking water, wastewater, and stormwater infrastructure, including the more than one million miles of pipes beneath our streets, is nearing the end of its useful life and must be replaced.

- Many communities strain to maintain and operate their water treatment systems because of lack of funding and a morass of conflicting and overly-burdensome regulations.

- Infrastructure projects across the U.S. are routinely delayed for years due to endless studies, layer-upon-layer of red-tape, bureaucracy, and lawsuits—with virtually no end in sight. This increases costs on taxpayers and blocks Americans from obtaining the kind of water infrastructure that is needed for them to compete economically.

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Quotes from Donald J. Trump on the Issue

- "We have a great plan and we are going to rebuild our infrastructure. By the way, her [Hillary Clinton] numbers is a fraction of what we're talking about, we need much more money than that to rebuild our infrastructure. Well I would say at least double her numbers and you're going to really need more than that. We have bridges that are falling down." -- Fox Business

- "We must make the investment in our fresh water infrastructure to ensure access to affordable fresh water solutions for everyone," he said on ScienceDebate. "We must explore all options to include making desalinization more affordable and working to build the distribution infrastructure to bring this scarce resource to where it is needed for our citizens and those who produce the food of the world." -- Business Insider

Campaign Promise

Mr. Trump will work with Congress to pass legislation that will reform several Acts to improve our nation's water infrastructure during the first 100 days of the Trump Administration. Trump says that clean water will be a "top priority" for his administration and that it may be "the most important issue we face as a nation for the next generation".

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EXECUTIVE SUMMARY

Water is our most precious resource, one that is essential to human life and health. Access to water depends upon a reliable water infrastructure system that preserves, treats, and delivers safe drinking water to our nation's communities. However, many communities strain to maintain and operate their water treatment systems, and as much as 25-30% of the treated water that goes into our distribution systems leaks into the ground as it flows through pipes installed as many as 150 years ago. Those losses not only squander a vital and sometimes scarce resource, they represent a massive waste of the energy and associated capital required to treat and pump that water. Water is also a vital national security issue.

Investment in water infrastructure means more jobs: every $1 billion invested in infrastructure creates or supports 28,500 jobs, and every dollar invested in water and wastewater infrastructure adds $6.35 to the national economy. Moreover, every dollar of water infrastructure investment generates $1.35 in tax revenue to the federal government and $.68 to state and local governments. Water also offers an opportunity to project American leadership and boost exports of U.S. solutions, products, and services abroad.

We should carefully prioritize and invest in water and wastewater infrastructure renewal that will ensure the public health, safety, security, and economic vitality of our communities.

Below is an agenda that will meet America's water and wastewater infrastructure needs for generations to come and make the United States a leader in bringing clean water and sanitation to the world.

I. ESTABLISH A COMPREHENSIVE, INTEGRATED, AND STRATEGIC APPROACH

A. Issue a Presidential Policy Directive (PPD) for an integrated and effective water infrastructure policy and strategy.
B. Establish a Presidential Commission on Water Infrastructure Policy Coordination and Security to evaluate and create a coordinated, rational, and efficient water infrastructure policy and a process for administration. Appoint an Assistant to the President for Water Policy and Security.
C. Incorporate water security as a priority in the National Security Strategy.
D. Complete a Global Water Strategy by October 2017.

II. INCREASE PUBLIC AND PRIVATE INVESTMENT IN AMERICA'S WATER INFRASTRUCTURE AND CREATE JOBS

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A. Remove the volume cap on private activity bonds (PABs).
B. Significantly increase congressional appropriations for State Revolving Funds (SRFs), enable private sector participation in SRF projects).
C. Increase the funding for the Water Infrastructure Finance and Innovation Act (WIFIA) Program.
D. Issue a "Buy American, Hire American" Executive Order on procurement.
E. Eliminate or modify U.S. Treasury tax rules and regulations related to defeasance that create obstacles to public-private partnerships and deployment of more private capital.
F. Retain tax exemptions for municipal bonds.
G. Encourage water utilities and operators to fully account for total costs.
H. Grant greater flexibility to the states to make use of unliquidated obligation (ULO) balances to provide an additional source of funding for projects.
I. Bolster the U.S. Environmental Export Initiative's focus on promoting the export of U.S. goods and services for water and wastewater.
J. Fund the U.S. Army Corps of Engineers Public-Private Partnership Demonstration Program.

III. MAKE AMERICA'S WATER INFRASTRUCTURE WORK BETTER

A. Promote Smart Technologies and Smart Cities.
   1. Establish the "National Water Infrastructure Test Bed Network".
   2. Regulatory reforms to promote adoption of better infrastructure technology.
      i. Reform technology approval process
      ii. Reform National Science Advisory Board
      iii. Infrastructure Investment Merit Test
   3. Enact legislation to promote 21st century digital water solutions.
B. The Regional Infrastructure Accelerator Demonstration Program.
C. Issue an Executive Order to strengthen the cyber security of America's water infrastructure.
D. Promote water infrastructure resilience and durability.
E. Empower local decision making.
F. Require life-cycle costing to ensure long-term value.
G. Improve systems management.
   1. Issue an Executive Order to deploy the Blue Wave program to build capacity for water and wastewater utilities.
   2. Develop a water workforce for the 21st century.
H. Promote integrated watershed management and planning.

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1. Codify EPA's Integrated Planning Process as an option for local governments to address their wastewater and stormwater management needs.
2. Amend the Clean Water Act to improve federal agency coordination and advance integrated water resources management (IWRM).
3. Reform the Agricultural Act of 2014 to protect water sources by reducing agricultural runoff in watersheds.
4. Issue an Executive Order to promote greater water quality trading (WQT).
5. Issue an Executive Order to promote water and wastewater regulatory reform.

IV. MAKE AMERICA'S WATER INFRASTRUCTURE SAFER AND MORE SECURE

A. Ensure water quality.
   1. Improve federal agency collaboration and support for state and local in water quality research, monitoring, and data collection.
   2. Issue an Executive Order to develop a "Knowledge and Information for Customers" (KIC) Lead program.
   3. Replace, fix, or otherwise remedy contaminated water service lines.
   4. Clarify EPA requirements for stormwater discharges from municipal water facilities.
B. Promote global water security.
   1. Establish a Center for Water Conflict Prevention and Resolution to enhance national security.
   2. Increase investment for improved global access to Water, Sanitation, and Hygiene (WASH).

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Our Challenge

Water is our most precious resource, one that is essential to human life and health. Access to water depends upon a reliable water infrastructure system that preserves, treats, and delivers safe drinking water to our nation's communities. However, "out of sight, out of mind" best describes our attitude toward water infrastructure. Much of America's drinking water, wastewater, and stormwater infrastructure, including the more than one million miles of pipes beneath our streets, is nearing the end of its useful life and must be replaced. Many communities strain to maintain and operate their water treatment systems. According to the U.S. Census Bureau, nearly half a million U.S. households still do not have access to safe drinking water or a working toilet. As much as 25-30% of the treated water that goes into our distribution systems leaks into the ground as it flows through pipes installed as many as 150 years ago. Those losses not only squander a vital and sometimes scarce resource, they represent a massive waste of the energy and associated capital required to treat and pump that water. In fact, as much as 19% of our nation's electricity consumption and 30% of our natural gas consumption is related to water treatment, pumping, and recovery. Compounding the problem, our shifting population brings significant growth to some areas of the country requiring larger pipe networks to provide water service, while population decreases in other areas deplete budgets necessary to sustain water systems built for larger customer bases. Water is also a vital national security issue. U.S. security experts expect that within ten years, countries of strategic interest to the U.S. will face significant water challenges and more and more will come to the U.S. for expertise.

In every crisis, there is opportunity, and the water infrastructure crisis is no different. Investment in water infrastructure means more jobs: every $1 billion invested in infrastructure creates or supports 28,500 jobs, and every dollar invested in water and wastewater infrastructure adds $6.35 to the national economy. Moreover, the investment is largely self-sustaining. With the increase in GDP, every dollar of water infrastructure investment generates $1.35 in tax revenue to the federal government and $.68 to state and local governments, tax revenues to help pay for the investment. Water also offers a unifying opportunity to make progress at home, while also projecting American leadership and boosting exports of U.S. solutions, products, and services abroad.

Our country has a choice: we can continue to ignore the problem, thus increasing the long-term burden for future generations,[1] or we can do the responsible thing and take a strategic approach

[1] "Tapping Private Finance and Delivery to Modernize America's Federal Water Resources," Ash Center for Democratic Governance and Innovation, Harvard Kennedy School (pending publication in January 2017). This report indicates that taxpayers typically spend several times more to fix infrastructure failures compared to the costs of routine maintenance.

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to carefully prioritize and invest in water infrastructure renewal that will ensure the public health, safety, security, and economic vitality of our communities.

President-elect Trump has set forth a bold vision for a new era of American infrastructure investment. His deficit-neutral plan aims to transform America's infrastructure "into a golden opportunity for accelerated economic growth and more rapid productivity gains with … substantial new infrastructure investments." Mr. Trump's vision includes developing a water infrastructure plan with cities, states, and federal leaders that, among other things, will "[t]riple funding for state revolving loan fund programs to help states and local governments upgrade critical drinking water and wastewater infrastructure," and "[l]everage new revenues and work with financing authorities, public-private partnerships, and other prudent funding opportunities." These and other investments, in turn, will be linked to "positive reforms to infrastructure programs that reduce waste and cut costs, [and] [c]omplete projects faster and at lower cost through significant regulatory reform and ending needless red-tape."[2] (emphasis added).

To make this vision a reality we must:

- Organize our efforts into a comprehensive, integrated, and strategic approach;
- Invest in America's water infrastructure and create jobs;
- Make America's infrastructure work better; and,
- Make America's infrastructure safer and more secure.

Below is an agenda that will meet America's water infrastructure needs for generations to come and make the United States a leader in bringing clean water and sanitation to the world.

I. ESTABLISH A COMPREHENSIVE, INTEGRATED, AND STRATEGIC APPROACH

The first order of business is to create the strategic framework for all other actions to modernize America's outdated water infrastructure and strengthen our water security. Mobilizing and aligning U.S. government agencies, the private sector, and civil society organizations will break down existing "silos" and ensure efficient coordination and implementation across the water sector. Establishing a strategic framework would set the foundation for all other executive, legislative, and regulatory actions to create appropriate enabling conditions for the success of other potential solutions. This includes the below actions:

[2] https://www.donaldjtrump.com/policies/an-americas-infrastructure-first-plan.

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A. Issue a Presidential Policy Directive (PPD) for an Integrated and Effective Water Infrastructure Policy and Strategy.

At present, the nation has no coherent nor comprehensive water strategy. Water policy is determined by as many as thirty federal agencies, commissions, and other organizations[3] who administer dozens of overlapping and often conflicting agendas, priorities, programs and regulatory regimes. In addition, each state has responsibility for administering their funding allocations from the Clean Water State Revolving Fund (CWSRF), the Drinking Water State Revolving Fund (DWSRF), the 2014 Water Infrastructure Innovative Finance Act (WIFIA) and the environmental regulatory system that drives much of the need for additional investment. Although EPA has primary jurisdiction over the SRF's at the federal level a myriad of requirements (not all of which are under EPA purview) are applicable to SRF projects due to the nature of federal funding. These silos of competing and conflicting regulatory and statutory regimes sometimes create significant inefficiencies and waste scarce resources, while hamstringing the effective management of our water and wastewater infrastructure.

As a foundational first step toward eliminating these obstacles to success, on Day One the President should issue a Presidential Policy Directive (PPD) outlining a vision for the development of a fully integrated, efficient and effective Water Infrastructure Strategy. The PPD would offer the overall strategic underpinning to all other federal action on water infrastructure. The President would prioritize water infrastructure development and security through policies and programs across U.S. economic development and national security interests.

The PPD would identify the following priorities: 1) Elevating water infrastructure modernization, improvement, and security as a national priority; 2) Establishing inter-agency coordination and oversight mechanisms, resources, and staffing to align U.S. government agencies' priorities, actions and budgets, and improve collaboration, coordination, and efficiency across federal agencies; 3) Encouraging local co-finance, full-cost and life-cycle accounting, and information sharing for federal assistance; 4) Strengthening compromised water and wastewater systems; 5) Promoting economic growth, development, and exports of U.S. technologies, products and services; and, 6) Advancing national security and international cooperation over water.

[3] Some of these agencies with include: U.S. EPA, the Departments of Agriculture, Defense, Energy, Interior, the U.S. Army Corps of Engineers, the Center for Disease Control and Prevention, and National Oceanic and Atmospheric Administration, the U.S. Agency for International Development, Export-Import Bank, and U.S. Trade and Development Agency.

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Timing: Day One
Proposal Type: Presidential Policy Directive
Draft Proposal: See Exhibit 1

B. Establish a Presidential Commission on Water Infrastructure Policy Coordination and Security to Evaluate and Create a Coordinated, Rational, and Efficient Water Infrastructure Policy and a Process for Administration. Appoint an Assistant to the President for Water Policy and Security.

In 1951, President Truman formed a President's Water Resources Policy Commission that successfully evaluated and recommended a program for the development, utilization, and conservation of water resources. In 1973, the U.S. National Water Commission (USDWC) developed a strategy for dealing with the water quality issues facing the nation at that time. There has been no effort at creating a consistent and coherent water strategy in the 43 years since.[4] The federal level of responsibility for water infrastructure and quality is currently shared across approximately thirty agencies, ten departments, and several independent commissions, councils, and offices. Although there are several informal inter-agency coordination mechanisms, they have had only limited success in breaking down the silos that create inefficiency, waste, and ineffectiveness.

As a means of implementing the PPD outlined above, the President should appoint a Commission on Water Infrastructure Policy Coordination and Security (the "Water Commission") to break down these silos and create a coordinated, rational, and efficient water policy and administration and foster better collaboration and coordination across federal agencies. This Water Commission should drive policy discussions and develop a national strategic plan for water investments, and would provide the overall strategic direction, coordination, and oversight to domestic and international water-related activities. This effort would include a review of cross-cutting regulations to substantiate whether the same remain applicable and warranted. Those that are not should be identified for potential elimination. The Water Commission should also consider convening a White House Water Infrastructure and Security Summit that would bring together industry, government agencies and other key stakeholders to highlight the importance of water as an economic development and national security priority.

[4] In 2005 the House of Representatives passed a bill entitled the "Twenty-First Century Water Commission Act of 2005" that would have established a commission to study and develop recommendations for a comprehensive water strategy to address future water needs. It was referred to Committee in the Senate but was not enacted. The Bill was reintroduced by Rep. John Linder (R-Ga) in 2009.

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Similar to the Defense Base Closure and Realignment Commission (BRAC), this bipartisan Water Commission would depoliticize the decision-making process, and linking revenue proposals to a national strategic plan would also raise confidence that infrastructure funds would be spent judiciously. Both factors should alleviate obstacles to approving new revenue sources or raising water rates.

The Water Commission would consist of no less than 11 and no more than 17 members appointed by the President, together with key federal ex-officio members such as the Secretaries of Agriculture, Defense, Energy, Interior, and State, the Administrator of the EPA, the Commanding General of the U.S. Army Corps of Engineers. The Commission's activities would initially be funded from the Executive Office Budget, but in his first budget the President should ask that Congress empower and resource the Commission in the White House, elevating the stature and important role as an inter-agency coordination mechanism.

Timing: Day One/First 200 days
Proposal type: Executive Order for formation of the Water Commission. Legislation and, as appropriate, executive action for implementation of the Water Commission's recommendations.
Draft Proposal: See Exhibit 2

The Water Commission's activities should be supported by an Executive Office within the White House, the Assistant to the President for Water Policy and Security. This office could be created without adding new head count or a budget increase by re-tasking the Office for Climate Change to include these responsibilities.

Timing: Day One
Proposal type: Executive Order
Draft Proposal: See Exhibit 2

C. Incorporate Water Security as a Priority in the National Security Strategy.

The PPD should recommend that water security be included in the next annual National Security Strategy to leverage U.S. strategic advantages in diplomacy, development, defense, intelligence, science, and technology and align U.S. government agency mission priorities.

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Timing: First 100 days
Proposal type: Presidential Policy Directive

D. Complete a Global Water Strategy by October 2017.

Under the Senator Paul Simon Water for the World Act of 2014, the Trump administration is required to issue a Global Water Strategy (the Strategy) by October 2017. The PPD should encourage the Presidential Commission on Water Infrastructure Policy Coordination and Security to work with the U.S. State Department and other agencies to provide recommendations on the key priorities to be contained in the Strategy, including how various foreign policy, defense, and export assistance agencies should interact.

Timing: First 200 days
Proposal type: Executive Report

II. INCREASE PUBLIC AND PRIVATE INVESTMENT IN AMERICA'S WATER INFRASTRUCTURE AND CREATE JOBS

Rebuilding our nation's water and wastewater infrastructure will require increased public and private capital investments. In its report *Buried No Longer*, the American Water Works Association and EPA have estimated it will cost between $650 billion and $1 trillion over the next 25 years to maintain current levels of water service. At the same time, private investors with billions of dollars of private capital are searching for ways to invest in water infrastructure. By creating the right mix of incentives, the United States can enhance the ability of state and local service providers to raise the capital they need and encourage significantly more private investment to help modernize America's water and wastewater infrastructure, thus putting millions of Americans to work in renewing our infrastructure for the 21st century.

U.S. infrastructure technologies, products, services, and know-how will also assist in building American competitiveness and economic growth in markets around the world. In 2012 U.S. exports of water purification technologies amount to approximately $1.8 billion.[5]

[5] U.S. International Trade Commission, 2012. "*USITC Executive Briefings on Trade U.S. U.S. Exports Of Water Filtration And Purification Equipment Show Significant Growth*" Available online: https://www.usitc.gov/publications/332/WaterFiltration9_17_12.pdf

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Background on Infrastructure Finance[6]

Water infrastructure capital projects are typically funded with pay-as-you-go with revenues from taxes, fees, and utility charges or debt financed through the municipal bond market. The U.S. Conference of Mayors estimates that in 2008, local governments invested $93 billion in their water systems, of which 40% went to capital investments, with the remainder for operations and maintenance. In 2014, municipal bond issuance for water and sewer projects totaled $31.9 billion according to the Securities Industry and Financial Markets Association (SIFMA). Total municipal bond issuance in 2014 was $314.9 billion, of which $282.8 billion was tax-exempt. From 2003 through 2012, tax-exempt financing for water and sewer facilities totaled $258 billion. While a summary of bond ratings for water and sewer debt is not available, a 2014 analysis of outstanding municipal market debt shows that 19 percent of issues were rated BBB or below, or were unrated. As such, the potential market for lower-rated investment-grade municipal borrowers, which could benefit most from WIFIA, is significant.

After pay-as-you-go and bonds, the next largest source of water infrastructure financing are the Clean Water State Revolving Fund (CWSRF) and Drinking Water State Revolving Fund (DWSRF) programs. The SRFs are state-operated finance programs that receive capitalization grants from EPA. These capitalization grants, combined with required state match and loan repayments with interest, allow the SRFs to provide a far greater amount of assistance annually than the amount appropriated for the programs. The SRFs provided $7.9 billion in assistance to projects across the country in 2015. In addition, communities also received water infrastructure funding through at least two other federal agencies in 2015. The U.S. Department of Housing and Urban Development (HUD) authorized $333.4 million in block grants to communities for water infrastructure projects, and the U.S. Department of Agriculture (USDA) approved $1.5 billion in grants and loans for small communities.

As suggested by the estimated size of national water infrastructure needs, currently available funding sources are not sufficient. SRF programs under the Clean Water Act and Safe Drinking Water Act are designed to primarily provide a benefit to smaller projects, typically under $100 million, in communities that often have limited access to funding. There is a large segment of need associated with projects that the SRFs cannot fund due to project size or ownership. The average CWSRF wastewater treatment project is $3.5 million, while the average DWSRF project is $2.4 million. According to the most recent data, states issued only 180 CWSRF loans over $50 million, and 35 of those were over $100 million, out of over 14,000 loans issued

[6] Excerpted from Federal Register /Vol. 81, No. 243 /Monday, December 19, 2016 /Rules and Regulations, p. 91822.

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since 2004. Since 2009, states issued only 20 DWSRF loans over $50 million, and ten of those were over $100 million, out of over 6,700 loans. Private wastewater treatment facilities are not eligible for most CWSRF financing.

Bond-financing requires strong debt service coverage to benefit from low interest rates and long tenors. In addition, private entities generally cannot access the tax-exempt bond market. Finally, grant funding and USDA loans are targeted at specific underserved sectors and are generally less applicable to large projects.

Similar to large-scale transportation projects, the financing of large water infrastructure projects can be addressed through the use of several financing tools and techniques that, when combined, can result in a highly efficient capital structure that minimizes the financial impact on system users. To assist in the financing of large scale projects, Congress enacted the Water Infrastructure Finance and Innovation Act of 2014 (WIFIA) as part of the Water Resources Reform and Development Act (WRRDA) of 2014. WIFIA established a new federal credit program for water infrastructure projects to be administered by EPA. Congress authorized EPA to provide federal credit assistance through WIFIA in the form of loans or loan guarantees to eligible entities: corporations; partnerships; joint ventures; trusts; federal, state, or local governmental entities, agencies, or instrumentalities; tribal governments or consortiums of tribal governments; or State infrastructure finance authorities. Generally, WIFIA projects must have eligible costs of not less than $20 million. However, for projects that serve a community of not more than 25,000 individuals, eligible project costs must be no less than $5 million.

WIFIA will assist in delivering on these needs in the water sector. WIFIA is in a position to promote the use of public-private partnerships in this area by reducing the cost of private participation. At the same time, WIFIA will have limited impact on the municipal bond market. Total municipal bond issuance was $314.9 billion in 2014, of which water infrastructure accounted for 10%. Even if WIFIA is able to provide $1 billion annual assistance, it will account for approximately 3% of the market for water infrastructure bonds such that the program is not expected to impact the municipal bond market.

Below are the key steps to mobilize increased water infrastructure investment:

A. Remove the Volume Cap on Private Activity Bonds (PABs).

Congress should amend the Internal Revenue Code of 1986 to remove the volume cap for private activity bonds used to finance water and sewage facilities. PABs are a form of financing whereby a private entity partners with state or municipal government to

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receive tax-exempt financing for a project (in this case water) that is in the general public's interest (as defined by law). Congress provides to states an annual allocation of the federal tax-exempt bonds, based upon population (Section 146 of the Internal Revenue Code). Historically, most of the tax-exempt bonds have been issued to politically attractive, short-term projects such as housing and education loans. The annual volume cap hinders the use of PABs for water and wastewater infrastructure, which are generally multi-year projects and out of sight. In recent years as little as 1-1.5% of all exempt facility bonds were issued to water and wastewater projects.

Removing water and wastewater projects from the restrictive state volume caps will increase private capital investment in the nation's aging water infrastructure by up to $5 billion annually according to the EPA, increasing jobs, GDP, and tax revenues while solving a tremendous public need. According to the Congressional Budget Office, over ten years this policy change could infuse $50 billion in private capital investment at a cost of only $354 million in lost tax revenue.

Timing: First 100 days
Proposal type: Legislation
Draft Proposal: See Exhibit 3

B. Significantly Increase Congressional Appropriations for State Revolving Funds (SRFs), Enable Private Sector Participation in SRF Projects.

Congress should authorize and appropriate funding for SRFs, which are the nation's principal federal-aid programs for clean and drinking water infrastructure, at the level of the greater of 20% of the funding provided in the Infrastructure Investment Package advanced by President-elect Trump, or $10 billion annually for the Clean Water State Revolving Fund (CWSRF) and $10 billion annually for the Drinking Water State Revolving Fund (DWSRF).

In addition, based on relevant recommendations from the Water Commission or a successor body, SRF authorizing legislation and implementing regulations and guidelines should be amended to:

1) Enable private sector entities to have access to SRFs, provided they are engaged in public-private partnership (P3) projects to serve the recognized needs of public agencies;

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2) Enable private sector entities to provide the source of the 20% matching funds for a qualified project (i.e., a P3 project providing water or wastewater services to a public agency);
3) Afford a preference, in the approval of grants or loans, to those projects that bring private investment to complement the federal financing; and,
4) Review and, where appropriate, relax or eliminate certain federal regulations governing SRFs.

Timing: First 100 days
Proposal type: Legislation

C. Increase the Funding for the Water Infrastructure Finance and Innovation Act (WIFIA) Program.

Congress should harness the authorized but unutilized WIFIA program and increase its size to support more for loan guarantees. In 2017, Congress should appropriate $1 billion for WIFIA. To leverage private sector funds as effectively as possible, a loan guarantee preference should be given to those projects that bring private investment to complement the financing of the project. Such preference should only apply to larger projects, e.g., serving communities with populations greater than 100,000. This change would provide greater access to private capital and leverage federal investments. When used to provide credit enhancements, every dollar provided by WIFIA will generate $65 in additional, private capital. Thus $1 billion of funding could generate as much as $65 billion in infrastructure investment.

Timing: First 100 days
Proposal type: Legislation

D. Issue a "Buy American, Hire American" Executive Order on Procurement.

Buy American laws applied to federal-aid infrastructure spending are critical to U.S. manufacturers. They provide producers with critical incentives to preserve production capacities in the United States, make significant capital investments to improve manufacturing capabilities, and maintain workforces critical to sustaining the communities around them.

The benefits of strong Buy American policies extend beyond economics. U.S.-made waterworks products conform to the world's most rigorous and effective, but also

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expensive and onerous environmental standards. American companies have invested significantly, at great cost, to modernize their U.S. operations to meet federal environmental and worker safety regulations. Every day, however, U.S. producers must compete against foreign foundries and mills that have no regard for worker safety, the environment, or public health and are not required to operate by standards comparable to those with which U.S. manufacturers must comply. In fact, the foreign-origin producers with whom U.S. iron and steel producers most often compete are also the most polluting. A typical foundry in China, for instance, emits more than 20 times the particulate (9.4 lbs. per ton versus 0.4 lbs. per ton) and nearly 35 times the carbon monoxide (149.4 lbs. per ton versus 4.4 lbs. per ton) than are emitted by a typical U.S. foundry. The carbon dioxide emitted from China's iron and steel industry accounts for as much carbon dioxide emissions as the rest of the global iron and steel industry.

Although Buy American laws and the markets to which they apply are of immeasurable importance, these laws apply to only a fraction of federal-aid infrastructure spending. Moreover, these laws typically only apply to the acquisitions of iron or steel products, which accounts for only a small fraction of the overall federal-aid infrastructure spending. A review of the federal-aid programs for drinking and waste water infrastructure demonstrates the limited application of these laws. At present, only the WIFIA, WRRDA and CWSRF have permanent Buy American requirements. The DWSRF has an annual requirement through the appropriations process, but Congress in 2016 declined to make that requirement permanent. Other programs with no Buy American requirement include the U.S. Department of Agriculture's Rural Utilities Services' Water and Waste Disposal Program, the U.S. Department of Housing and Urban Development's Community Development Block Grant program, the U.S. Bureau of Reclamation's Rural Water Supply program, the Economic Development Administration's Public Works and Economic Development Program, and the Indian Health Services, Facilities and Environmental Health program.

On the first day of his administration, the President should issue a "Buy American, Hire American" Executive Order that:

- Mandates the use of American made products on all federally funded and assisted water infrastructure projects; and
- Establishes a Buy American/Hire American Directorate within the White House to ensure consistent and diligent enforcement of all Buy American requirements and the elimination or modification of any waivers, exceptions, or exemptions that are inconsistent with the intent of Congress or the Presidential Executive Order.

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To ensure that these protections and benefits are preserved, Congress should amend all authorizing programs related to spending on water infrastructure to include a domestic preference. Among the water programs that should be amended to include a permanent domestic preference are: The DWSRF; USDA Rural Utilities Service, Water and Waste Disposal Program; HUD Community Development Block Grant; Department of the Interior, Bureau of Reclamation, Rural Water Supply; Economic Development Administration, Public Works and Economic Development Program; Indian Health Services, Facilities and Environmental Health.

Timing: Day One/First 100 days
Proposal type: Executive Order/Legislative

E. Eliminate or Modify U.S. Treasury Tax Rules and Regulations Related to Defeasance that Create Obstacles to Public-Private Partnerships and Deployment of More Private Capital.

Current regulations discourage many municipalities from entering into cost-saving and efficiency-driven partnerships with private water companies for the operation of municipal water supply and treatment facilities. Given the current state of the U.S. economy, and that infrastructure planning is deferred to state and local governments, leaders are challenged to think in new ways to improve their financial flexibility to address other important city priorities and to ensure critical infrastructure investment in their water systems, and they look to the private sector for assistance. An estimated $100 billion in private capital is available to invest in the domestic U.S. domestic water and wastewater market, which some experts have valued at approximately $130 billion. Municipalities often determine that their water service can best be provided either by selling to or in a partnership with a private water company. However, current IRS regulations impose a significant financial penalty on municipalities who sell or lease their water system to a private company if it was originally financed with tax-exempt debt. Removing tax inefficiencies for lease and sale of municipal water systems will provide greater options and opportunities for communities with failing water systems to attract more private investment and expertise to rehabilitate and restore failing water infrastructure though public-private partnerships.

Most municipalities have issued bonds over the years that were used for the purchase, upgrade and/or maintenance of their water facilities. If a municipality with such bonds outstanding chooses to engage in a public-private partnership for the provision of water

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services, existing rules essentially require that the municipality either pay off the bonds or set aside funds (in a process known as defeasance) to pay off the bonds before entering into the public-private partnership. During the past several years since interest rates have been at historic lows, the cost of defeasing bonds has been unusually high because the issuer must set aside enough funds to provide for the defeased bonds while investing at very low rates (for example, providing for interest on bonds paying a 5% rate while investing the defeasance escrow at 1%). The funds required for defeasance could be 120% or more of the tax-exempt debt defeased, reducing the amount of funds that could otherwise be used to finance operations and maintenance expenses, make capital investments, or reduce rates for the customers. This discourages municipalities from entering into public-private partnerships.

To better enable municipalities to enter into public-private partnerships, the Treasury Department should broaden the remedial actions under Section 141 of Treasury's rules so that permitted alternative uses of disposition proceeds also apply to public-private partnership transactions. This simple change would provide municipalities with greater financial flexibility and eliminate the economic loss of funds through a defeasance action. However, the rules should continue to require that the affected bonds be retired on their first call date, so as to eliminate the often significant cost resulting from "negative arbitrage" on the defeasance escrow. In addition, for both dispositions and public-private partnership, Treasury guidance is needed to make clear that legitimate governmental purposes for the use of proceeds include the payment of debt service on other obligations of the issuer and contributions to public pension plans.

Prior to the Tax Reform Act of 1986, the IRS tended to apply the tax-exempt bond rules based on the bond issuer's expectations when it issued the bonds. After the 1986 Act, the IRS increasingly viewed compliance with all the tax-exempt bond rules as something that had to continue throughout the term of the bonds based on actual compliance/noncompliance rather than based on the issuer's expectations regarding compliance when it originally issued the bonds. It was as part of this effort that the IRS imposed the rules saying that "changes of use" of bond financed facilities, such as sales and leases, can cause the bonds to become taxable unless a remedial action is taken. In order to allow for more efficient public-private partnerships to go forward, a narrowly tailored modification to IRS regulations on defeasance is needed, which would stipulate that defeasance as it relates to the sale or lease of municipal water systems is not required where certain conditions or criteria are met that protect taxpayer interests while avoiding penalties to municipalities.

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On Day One the President should sign the Executive Order attached as Exhibit 4, which sets forth specific amendments to section 1.14112 of the Treasury Regulations.

Timing: First 100 days
Proposal type: Executive Order, Regulatory action and Legislation
Draft Executive Order: See Exhibit 4

F. Retain Tax Exemptions for Municipal Bonds.

Tax-exempt municipal bonds are the primary means by which utilities and municipalities raise capital for water infrastructure projects. The market for these bonds provides an established, reliable, and efficient mechanism for public utilities to raise low cost capital. The tax-exempt feature of these bonds should be preserved in any tax reform measures adopted by Congress.

G. Encourage Water Utilities and Operators to Fully Account for Total Costs.

In part because of a steady decline in federal funding for water infrastructure, approximately 98% of water projects are financed by local water utilities through their rate structures. However, water is arguably the world's most undervalued resource, as traditional approaches to pricing have not reflected the true cost of service. A recent survey found that only one-third of water utilities are operating under rate structures that provide adequate revenue to fully cover their costs. This undervaluation of water as a commodity creates severe constraints on the ability of utilities to finance the investment required as their infrastructure continues to age. To correct this problem, a multi-faceted approach is needed – one where the true cost of water is understood and water is priced to meet the growing needs for investment in the system, while ensuring that lower-income households have reliable and affordable water service.

State and local water agencies are best suited to determining how best to meet the needs of their water consumers. Where federal support might be needed, federal agencies should nonetheless encourage all utilities and their users to bear their fair share of the costs of maintaining their systems. Utilities of a certain scale and service scope that apply for Federal SRF, WIFIA, or "Low-Income Water Assistance Program" (LIWAP) funding (see below) should be required to conduct and produce as part of their applications a study of the total costs associated with constructing, operating, and maintaining their water, wastewater and storm water systems, including long-term capital costs. The report should also outline a pricing structure and a plan for implementing a pricing program that

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will capture all of those costs. Once submitted, the approving agency should either: (1) require that the applicant commit to the implementation of that structure as a precondition to the recipe of federal assistance; or (2) include the applicant's implementation of a full-cost pricing program among the agency's selection criteria for project approvals (See Section IIID, below). Either of these steps could be implemented by executive order, rulemaking, or legislative action.

The second step would be to ensure that low-income customers are protected against significant rate increases that jeopardize their health and well-being. To accomplish this safety net Congress should establish a support fund modeled on the Low-Income Home Energy Assistance Program called the "Low-Income Water Assistance Program" (LIWAP). Eligibility for LIWAP assistance would be based on stringent guidelines and managed by through the Department of Health and Human Services (HHS). This initiative would facilitate equity and affordability among low-income consumers alongside and full cost pricing of non-LIWAP customers. It would thus reduce the political constraints on the ability or willingness to raise rates so that they more realistically reflect the true cost and value of water.

Timing: First 100 days
Proposal type: Executive Order and Legislative. Pending the Water Commission's recommendations, issue executive order and regulatory change to require applicants for federal-aid to complete full-cost studies and establish prioritization criteria for applications for assistance. Legislation would be needed to make criteria permanent and implement related programs to assist low-income water consumers.
Draft Proposal: See Exhibit 5

H. Grant Greater Flexibility to the States to Make Use of Unliquidated Obligation (ULO) Balances to Provide an Additional Source of Funding for Projects.

This change would accelerate completion and delivery of water supply and wastewater treatment projects to communities facing urgent challenges. "ULO balances" refer to unspent funds from grants provided by EPA to the states to support the financing of infrastructure improvements to drinking water systems. States may also use a portion of their DWSRF grant funds as set-asides for other important public health protection purposes. For example, these funds can be used to help water systems, particularly small systems, strengthen their technical, managerial and financial capacity; to implement state Public Water System Supervision (PWSS) programs; or to provide support for source

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water protection. Annual grant funds to states may go unspent for various reasons, including but not limited to the following:

- Projects fail to progress in a timely manner, coupled with state's inability or unwillingness to deallocate the funds and repurpose the same towards other projects;
- Lack of demand for the funds in certain states;
- Lack of readiness to proceed with projects, or a state's inability to identify ready projects;
- A state's failure or delay in establishing effective financial, managerial and technical assistance programs, despite having previously set aside funds for the same purpose; and,
- A state's inability to draw down the annual grant funds for various reasons, including match portion concerns.

The new Water Commission should develop a program for assessing the current balance of ULO's across the states, and then incentivizing the states to utilize these funds to advance needed DWSRF and similar projects. In particular, the Water Commission should focus on incentives to use private capital, and to promote engagement with private parties, and to accelerate needed projects. The focus of regulatory reform might be on developing flexibility in the use of ULOs for this purpose. In this way, funding that has already been allocated to the states in previous years – but simply remains unspent – could be applied to meet current-year and future-year water infrastructure needs and thus reduce the level of additional appropriations necessary.

Timing: First 200 Days
Proposal Type: Regulatory reform

I. Bolster the U.S. Environmental Export Initiative's Focus on Promoting the Export of U.S. Technologies, Goods and Services for Water and Wastewater.

Water is at the core of economic development. Smart water action can promote economic growth, as we apply American ingenuity and innovation to solving water and wastewater challenges. Water should not become an impediment to economic growth in the U.S. and globally. The Trump administration should promote export opportunities for U.S. water technology innovation by harnessing "Buy American" policies and boosting U.S. government commercial diplomacy to expand the export of U.S. technologies and expertise, such as reverse trade missions and engagement with U.S. embassies and

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missions in key markets. The proposal would also promote a "whole of U.S." approach by elevating coordination and integration among U.S. export assistance programs at the Export-Import Bank, Overseas Private Investment Agency, U.S. Department of Commerce, U.S. State Department, and the U.S. Trade and Development Agency to prioritize water security as a key issue, jointly support specific investments to reduce duplication and risk, and strengthen market intelligence efforts. This will support increased growth of U.S. jobs and sales of U.S. products and services in key international markets.

In addition, American manufacturers should have priority in bidding on all U.S. funded foreign aid projects.

Timing: Day One
Proposal type: Executive Order
Draft Proposal: See Exhibit 6

J. Fund the U.S. Army Corps of Engineers Public-Private Partnership Demonstration Program.

Our nation's inland waterways – chief among them the Mississippi and Illinois rivers – are critical to America's economic well-being. But the infrastructure of these rivers and others is in serious need of improvement. Many of the locks and dams required for the safe and efficient passage of goods and products on these rivers were built during the Roosevelt Administration – almost 80 years ago. The U.S. Army Corps of Engineers (USACE) is overwhelmed and underfunded. It is estimated that the necessary repairs and upgrades to many locks and dams could take many decades to complete. Public-private partnerships (P3s) can be a powerful tool for our nation to work with the private sector to meet our growing infrastructure needs.

Over the years, Congress authorized thousands of locally popular projects for the USACE to undertake. Unfortunately, the federal budget for the USACE has not matched the list of projects and backlog now exceeds $40 billion. Because the need for these projects has not diminished and the federal budget is not likely to grow over the next few years, an alternative financing method would be necessary to fund them.

The U.S. Army Corps of Engineers Public-Private Partnership Demonstration Program was incorporated into Public Law 113-121 (the 2014 WRRDA law as Section 5014), and created the USACE's first public-private partnership program to promote more innovative financing in critical water projects that involve the USACE. It is a pilot program whereby

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the Secretary of the Army for Civil Works is authorized to pursue fifteen projects nationwide and allow the USACE to enter into P3 agreements that expedite critical projects.

Funding this program is a cost-effective and bipartisan solution to reducing the USACE backlog while simultaneously pursuing alternative delivery solutions for critical water projects like flood protection and inland waterways rehab nationwide. It will remove financial burdens from the USACE and taxpayers, stimulate growth in the private sector and guarantee our waterways remain safe and navigable for the countless number of goods and products that float down these rivers every day to markets across the world. To advance this program Congress should appropriate adequate funding, s recommended by the Water Commission.

Timing: First 100 Days
Proposal type: Legislation

III. MAKE AMERICA'S WATER INFRASTRUCTURE WORK BETTER

American ingenuity is second to none, as our cities, states, and private enterprise represent tremendous laboratories for new ways to grow our economy while using and re-using water more efficiently. The best thing the federal government can do is to empower state and local authorities and the private sector to do what Americans do best: innovate. Below are key actions that will unleash America's know-how, strengthen the technical and managerial skills of our workforce, vastly improve the efficiency and resiliency of our water systems, and promote the development, deployment, and diffusion of 21st century solutions throughout the United States and around the world.

A. Promote Smart Technologies and Smart Cities.

Non-revenue water (NRW) can account for 50% of total water withdrawn from the environment due to distribution system leaks, theft, and poor measurement techniques. The World Bank estimates that the total cost to water utilities caused by NRW worldwide can be conservatively estimated at $141 billion per year and represents enough water to service nearly 200 million people. In the U.S. infrastructure issues including water main breaks, sanitary sewage overflows, untreated wastewater and storm water overflows, and water pipe degradation could increase costs to households through higher water rates by an estimated $59 billion, and a $147 billion cost increase to utilities by 2020.

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Water service providers are oftentimes unaware of an issue, such as a pipe leak, until it literally surfaces and bursts. Without a full set of data and actionable information into network infrastructure conditions, operators are trapped in a negative reactive cycle. In addition, most utilities continue to utilize water quality and pressure monitoring techniques that provide incomplete and often stale information about critical situations such as toxicity and chemistry, a situation that can endanger the public's health and the integrity of the water systems.

Many utilities are embracing the Internet of Things (IoT) as a way to address these urgent problems. For example, wireless technology and new sensing and metering capabilities create opportunities for remote but inexpensive real-time flow and quality monitoring. These digital water solutions, together with the associated software, will transform the way utilities manage water and wastewater treatment, distribution, and usage using software solutions. According to research commissioned by utility infrastructure company, Sensus, digital water networks can save utilities up to $12.5 billion a year. Digital water solutions can connect water plant operations with distribution networks to optimize the holistic treatment and delivery life-cycle for drinking and wastewater. Software-as-a-Service (SaaS) can produce operational efficiencies that improve water quality and availability for municipalities and consumers worldwide. Using data and analytics, digital industrial companies can work with utilities and consumers globally to solve the challenges of water distribution and monitoring and storm water and wastewater collection. Municipalities and water utilities worldwide can use a seamless software solution set built on industrial internet platforms to put their data to work, addressing infrastructure maintenance, health concerns, manpower constraints, and water conservation.

This section offers a spectrum of policy tools that remove barriers to digital water adoption.

1. Establish the "National Water Infrastructure Test Bed Network".

Current funding for water infrastructure investments primarily focuses on providing communities with the funds to repair and replace water infrastructure. There remains a significant need for development and deployment of innovative technologies to ensure new infrastructure can meet our next generation water and wastewater needs. Funding opportunities already exist for early stage research and technology development and for later stage commercial deployment in the innovation chain. However, America lacks sufficient focus on the middle stage, which includes the

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bench, pilot, and full-scale demonstrations of technologies. Unless utility operators have the confidence that new technologies will work, they are reluctant to adopt or deploy them. But few are willing to serve as the pilot program because of the demands on time and budget, and even those pilot programs that do proceed can take years to complete. As a result the deployment of workable, cost-saving and efficiency- creating technologies is unnecessarily delayed.

EPA's Environmental Technology Verification program provided a mechanism for industry and consumers to evaluate various water infrastructure technologies, and compare and contrast their capabilities and performance. It received mixed reviews and was retired in 2014. Nevertheless, the need for common and transparent technology evaluation and commercialization remains.

Given the significant and capable laboratory testing and analysis capabilities that exist at EPA's Cincinnati complex (including the National Risk Management Program's Test & Evaluation Facility, the Andrew Breidenbach Environmental Research Center, Center Hill Facility, Experimental Stream Facility), EPA's Office of Research & Development should add technology verification and evaluation to the mission of these facilities. Congress should also enact legislation authorizing and funding creation of a "National Water Infrastructure Test Bed Network (TBN), based at the Cincinnati complex to promote greater uptake of 21st century water and wastewater technologies. The TBN would coordinate and accelerate the water industry's deployment of new technologies. The TBN would provide a systematic and organized approach to the commercialization of innovative technologies in the U.S. water industry. It would bring together the broader water community (i.e., regulators, operators, consulting engineers, etc.), and engage them in piloting and demonstration efforts to raise confidence in innovative technologies. The network would store data/results from pilot projects and make this information readily available to stakeholders. The TBN's process would reduce the number of pilot projects otherwise needed by making the pilot data more broadly applicable (from a regulatory perspective). It would also shorten the time needed to pilot a technology to achieve commercial acceptance.

Timing: First 100 days
Proposal type: Legislation
Proposal Draft: See Exhibit 7

2. Regulatory Reforms to Promote Adoption of Better Infrastructure Technology.

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Duplicative, unnecessary and/or outdated regulations present a significant barrier to addressing water infrastructure issues. Public water authorities are loath to take substantial risks in new and efficient technology procurement, because they must manage an essential public service for perpetuity and at minimum cost. This creates the need for efficient and transparent EPA efforts to foster sound and timely infrastructure investment. Some specific examples of opportunities for EPA reform:

i. Reform Technology Approval Process.

Both the Safe Drinking Water Act and Clean Water Act require utilities to use EPA approved protocols for monitoring and treatment. While EPA's drinking water offices have implemented an Alternative Technology Approval process that has significantly expedited the commercialization of new technologies, the wastewater program has not adopted this new, more efficient process. As a result, the deployment of new technologies in the wastewater sector has been slow. The agency should adopt the same approval processes across its programs so that they are consistent and efficient. In addition, the agency should use existing consensus bodies (e.g., ASTM, AWWA) to the maximum extent possible to foster best management practices and standards that support the technology adoption, while minimizing agency expenditures on this mission.

ii. Reform National Science Advisory Board.

EPA's National Science Advisory Board plays an essential function in advising the agency on all manner of technical issues affecting regulatory promulgation and the water sector. This board should be comprised of representatives from across the water sector in a balanced fashion, so that the agency fully understands state-of-the-art science, industry practices, and the challenges facing water infrastructure owners and managers and their rate-payers.

iii. Infrastructure Investment Merit Test.

Both the grant programs and the regulatory apparatus administered by EPA keenly impact the character and velocity of water infrastructure investment. Coherent standards and best management practices should be embedded in the grant and regulatory efforts to encourage speedy adoption of sound and resilient infrastructure that will last for more than 100 years.

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For example, the Philadelphia Water Department commissioned a triple-bottom-line analysis that considered economic, environmental, and social benefits of a suite of resilient infrastructure investments that have minimized compliance costs, led to some permit flexibility, and decreased rate-payer costs. The notion of a *Merit Test* is recommended – not to rank investment options among regions or states – but to evaluate and promote those technologies, designs and practices that will minimize life-cycle costs to investors or rate-payers in water infrastructure. Adoption of *Smart-City* policies and guidelines, *LEED* and U.S. Green Building Alliance practices, or the Institute for Sustainability's *Envision* ratings are all pathways to ensuring long-term efficient and sound water infrastructure investment.

3. Enact Legislation to Promote 21st Century Digital Water Solutions.

The Internet of Things brings together people, machines, and data to solve problems in a faster, more predictive way. It can enable water utilities to connect their physical assets with other key pieces of information, such as soil conditions, water chemistry and quality, and geospatial seismic activity, into a single platform to expedite the process for fixing infrastructure problems, reducing service disruptions, decreasing water losses, avoiding public health emergencies, and predicting other potential problems for early intervention. Similarly, industrial companies can utilize this key information to streamline plant operations, build resilience, and use water and energy more efficiently. Enhanced opportunities for utilities and industrial companies to utilize digital water projects will improve America's water infrastructure, optimize industrial water consumption, and create high-value jobs.

Expanding existing water infrastructure funding programs (SRFs, WIFIA, and private activity bonds) to include digital water projects as eligible activities will promote rapid and wide-spread adoption of digital water solutions, and in turn create high-value jobs for digital water solutions providers and utilities.

Similarly, industrial companies could benefit from a 30% investment tax credit (ITC) to incentivize the use of digital water solutions and improve the efficiency of their operations. This tax credit could be as high as 30%, depending on demonstrated results commensurate with efficiencies achieved. For example, if a company spent $10 million implementing digital water solutions to make its operations more efficient

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and to reduce energy and water consumption, that company would be eligible to receive up to a 30% tax credit.

Timing: First 100 days
Proposal type: Legislation
Proposal Draft: See Exhibit 7

B. The Regional Infrastructure Accelerator Demonstration Program.

A major challenge in infrastructure development is lack of resources and tools to explore innovative procurement methods. When faced with the option of traditional procurement or innovative financing, local project sponsors, who almost certainly lack expertise in project financing, will undoubtedly rely on traditional methods even if the numbers make sense to bring in private financing.

The Regional Infrastructure Accelerator Demonstration Program, as included in the FAST Act as Section 1441 (Public Law 114-94), will demonstrate a model that will support efficiency, safety, and expediency in infrastructure development across the United States. The objective of the infrastructure accelerators is to facilitate project development through a unique regional platform designed to spur infrastructure innovation and accelerate a pipeline of infrastructure projects in the partner states. The accelerator model will help public sector decision-makers develop best practices and access expertise in project financing while also providing certainty to potential investors and stakeholders through the development of common standards to a variety of projects and infrastructure types. The accelerators will serve local and regional interests through the planning, delivery and oversight of major infrastructure projects using innovative approaches. The accelerator's services will augment the states' and local project sponsors' abilities to undertake the planning and procurement of complex projects, specifically those involving the use of private sector expertise, services, and capital. The program allows for a broad definition of infrastructure that includes water projects, but also those related to transportation and energy.

The program is bipartisan and fully authorized, but unfunded. The President's Budget should fund it within U.S. Department of Transportation for $12 million.

Timing: First 100 days
Proposal type: Legislation

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C. Issue an Executive Order to Strengthen the Cyber Security of America's Water Infrastructure.

Many water and wastewater utilities remain poorly equipped to prevent or recover from cyber-attacks. Enabling utilities to better withstand cyber-attacks is vital to improving water and wastewater systems management and to maintain public confidence in those systems.

The President should issue an Executive Order directing coordinated federal participation in collaborative public-private efforts to: 1) Boost cybersecurity of U.S. water systems; 2) Expand aggressive investigation and prosecution of cyber attackers; 3) Enhance programs that support and build cyber risk management capacity of all critical infrastructure sectors; and, 4) Provide technical support to help water utilities, particularly small and medium-sized utilities, overcome the technical knowledge and skills gap related to cyber security systems.

Timing: First 100 days
Proposal type: Executive Order

D. Adopt Prioritization Criteria for the State Revolving Funds to Promote More Effective and Efficient Water Infrastructure Investment.

As noted above, the Water Resources Reform and Development Act of 2014 (WRRDA), created the Water Infrastructure Finance and Innovation Act of 2014 (WIFIA), which authorizes EPA to provide secured (direct) loans and loan guarantees to eligible water infrastructure projects. Section 3907(b) (2) of the statute establishes 11 criteria for evaluating and selecting among eligible projects. In its proposed interim final rule implementing the new WIFIA program, EPA added two additional criteria and modified several others.[7] The weightings will be established in a separate Notice of Funding Availability (NOFA).

[7] As proposed in the interim final rule the criteria are: 1. The extent to which the project is nationally or regionally significant, with respect to the generation of economic and public health benefits; 2. The likelihood that assistance under this subtitle would enable the project to proceed at an earlier date than the project would otherwise be able to proceed; 3. The extent to which the project uses new or innovative approaches such as the use of energy efficient parts and systems, or the use of renewable or alternate sources of energy; green infrastructure; and the development of alternate sources of drinking water through aquifer recharge, water recycling or desalination; 4. The extent to which the project protects against extreme weather events, such as floods or hurricanes, as well as the impacts of climate change; 5. The extent to which the project helps maintain or protect the environment or public

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These prioritization criteria provide guidance to the states and assistance applicants that encourages the deployment of funds in rational and effective manner by focusing applicants on considerations such as increasing the utilization of private sector funding, using innovative technology, energy savings,[8] resiliency and sustainability,[9] water and resource conservation.[10] Unlike regulatory mandates, however, they do not dictate how

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health; 6. The extent to which a project serves regions with significant energy exploration, development, or production areas; 7. The extent to which a project serves regions with significant water resource challenges, including the need to address water quality concerns in areas of regional, national, or international significance; water quantity concerns related to groundwater, surface water, or other resources; significant flood risk; water resource challenges identified in existing regional, state, or multistate agreements; and water resources with exceptional recreational value or ecological importance; 8. The extent to which the project addresses identified municipal, state, or regional priorities; 9. The readiness of the project to proceed toward development, including a demonstration by the obligor that there is a reasonable expectation that the contracting process for construction of the project can commence by not later than 90 days after the date on which a Federal credit instrument is obligated for the project under this subtitle; 10. The extent to which the project financing plan includes public or private financing in addition to assistance under this subtitle; 11. The extent to which assistance under this subtitle reduces the contribution of Federal assistance to the project; 12. The extent to which the project addresses needs for repair, rehabilitation or replacement of a treatment works, community water system, or aging water distribution or wastewater collection system; and 13. The extent to which the project serves economically stressed communities, or pockets of economically stressed rate payers within otherwise non-economically stressed communities.

[8] Treating and pumping water through our utility systems represents a huge portion of the nation's total energy consumption – as much as 19% of all electricity consumption and as much as 30% of natural gas use. Ensuring that applicants focus on reducing energy costs at the initial design phase can significantly reduce energy consumption, which in turn reduces operational costs. These savings can be redeployed to fund other infrastructure investments or reducing utility rates.

[9] Our nation's aging infrastructure faces challenges from natural disasters, such as earthquakes, hurricanes, and increased traffic loads. Given that the costs and inconvenience of excavating and replacing damaged infrastructure can be enormously expensive, especially in dense urban areas, federal agencies and programs should encourage the use of systems and materials that demonstrate superior performance, including those that are the most durable and provide the longest useful lives. Investing in resilient water infrastructure will save money over the short and long-term term in both operating and maintenance (O&M) costs and capital expenditures.

[10] The promotion of recycling in federal acquisitions is one means of conserving water and other resources and reducing costs. Recycling water and wastewater reduces energy consumption, thus reducing O & M costs, by reducing the amount of treatment necessary. Encouraging the use of materials with recycled content increases job growth in recycling industries, reduces energy consumption by reducing resource extraction and processing, and reduces solid waste generation which in turn reduces the number and size landfills. Under Section 6002 of the Resource Conservation and Recovery Act, EPA is required to designate items that are, or can be, produced with recovered materials and to recommend practices for purchase of these items. The EPA's Comprehensive Procurement Guideline (CPG) program has identified 61 products in eight categories. In addition to adding recycled content to the prioritization criteria, EPA should expand the CPG program to cover a broader range of construction products used in water infrastructure projects.

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these goals are achieved or prioritized by the applicant; rather, they leave room for the applicants to innovate creatively and to determine the right mix of considerations for their circumstances.

As enacted, WIFIA is available to fund projects of more than $20 million (or small system projects of $5 million), and may be used in conjunction with financing from other programs such as the SRF's. To ensure uniform standards in the application of these funds and the achievement of the goals Congress set forth in the WIFIA selection criteria should be applied to all federal water assistance programs, including the SRF's, WIFIA, and rural assistance programs within the Department of Agriculture.

Timing: First 100 days
Proposal type: Executive Order and Regulatory action
See attached Exhibit 9

E. Empower Local Decision Making.

Communities across the country have diverse water and wastewater infrastructure needs. They must evaluate numerous factors when considering the proper design and materials for their community and water projects. Encouraging and supporting local governance allows those closest to the problem to determine the best solution. Deference to local decion-making also saves money, as local communities can hold those in their community more accountable. Federal agencies should defer to the engineer of record so long as the designs meet nationally recognized standards for water projects, absent extraordinary circumstances demonstrating arbitrary action.

Timing: First 100 days
Proposal type: Executive Order

F. Require Life-Cycle Costing and Pricing to Ensure Long-Term Value.

To ensure that the true costs of building, maintaining, and operating our water systems are captured and funded, all federally supported projects should require full life-cycle cost analyses that demonstrate the true cost of systems and materials over their entire useful lives as a comparative tool at the project specification setting and proposal evaluation

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stages. Life-cycle cost estimates provide an accounting of all resources and associated cost elements required to develop, produce, deploy, and sustain a particular program or project. Thereafter, purchasing decisions and bid awards should be based on full life-cycle costs rather than merely the upfront cost.

Currently owners of water infrastructure projects are incentivized to design and build systems emphasizing short-term, initial costs, without giving appropriate consideration to longer-term considerations such as O&M, as well as considering useful life expectancy. They often design and award projects that may offer short-term acquisition cost benefits to the detriment of future generations that will be faced with higher O&M costs as well as faster replacement decisions. Proper project analysis should emphasize the local use of an economic life-cycle cost analysis to determine the least cost of alternatives over the design life for federally funded infrastructure projects.

Economic evaluations of alternatives using a Life-Cycle Cost Analysis (LCCA) to determine the least cost of those alternatives is a common approach in the private sector and in direct procurement by many federal agencies. LCCA facilitates the consideration of the full cost of alternatives during the design phase of a proposed project, including cost factors beyond upfront purchase prices, such as installation costs, energy consumption over the useful life, maintenance expense, and costs to replace alternatives with longer or shorter useful design lives. In doing so, an economic evaluation of the true least cost alternative is achieved.

Examples of the use of life-cycle costing in federal programs include:

- The Office of Management and Budget in 2 CFR 200.320(c) states that for sealed bids, "life-cycle costs must be considered in determining which bid is lowest" when such considerations are included within bid specifications.
- The Interagency Memorandum of January 2013 (among the USDA, EPA, HUD, and DHHS) details best practices for the development of Preliminary Engineering Reports. For these reports, a LCCA is needed.
- The USDA Rural Utilities Service requires facilities financed by the agency to be designed to provide the "most economical services practicable." See 7 CFR 1780.57.
- The Council on Environmental Quality (CEQ) issues Principles and Requirements and Interagency Guidelines for Water and Land Related Resources Implementation (PR&G). The most recent standards state that economic, social, and environmental measures should be considered when analyzing sustainable economic development.

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- The Department of Transportation Office of Asset Management published a LCCA primer in 2002 that stated, "LCCA provides a means...to extend consideration of the merits of alternative projects beyond initial agency costs to include future agency and user costs. Additionally, LCCA documentation, as well as the analysis itself, can be used to demonstrate management's commitment to good stewardship and to making the analytical process more transparent and efficient."

To ensure that water infrastructure projects are built, operated, and maintained in the most cost-efficient manner over the long-term, the Trump administration should issue an Executive Order that would ensure all federally financed or assisted water projects require consideration of a LCCA in the design and purchase of all systems and materials.

Timing: First 100 days
Proposal type: Executive Order and Regulatory Action

G. Improve Systems Management.

1. Issue an Executive Order to unleash the "Blue Wave" to Build Capacity for Water and Wastewater Utilities and Other Water Resources Managers.

The President should issue an Executive Order creating a platform for collaboration among public enterprises, in the form of a web-based portal and network – the "Blue Wave." This portal would enable urban and rural utilities of every size and service to share best practices, develop joint partnerships with public and private agencies, engage private sector expertise and technology and access private capital markets and funding. In addition, this network would provide small rural and distressed water systems with the technical capacity to comply with regulations and to undertake projects to improve or expand their services.

The United States has more than 60,000 water utilities, the majority of which are small utilities (serving less than 10,000 customers). Thousands of small utilities have difficulty in assessing, selecting, implementing, and financing necessary capital upgrades or in implementing new smart technologies that can improve service and reduce operating costs. By creating the "Blue Wave" to deliver up-front expertise and transaction support and foster public-private partnerships, the federal government would enable small utilities to carry out quickly a backlog of vitally needed capital improvements worth hundreds of billions of dollars. This

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would generate tens of thousands of jobs and boost U.S. businesses engaged in design, construction, maintenance, operations, and technology and scientific support.

A relatively small investment of the federal government to support the start-up costs (approximately $5 million per year for two years from the appropriated funding for the state revolving funds), to be matched 2:1 by the private sector, would fully support the development of the network. Membership in "Blue Wave" would be cost-free to agencies seeking assistance, although a fee would be assessed on successful partnerships and collaborations to cover the on-going costs of the Blue Wave Network.

"Blue Wave" is designed to be the implementation arm of many of the parallel water infrastructure proposals to small and distressed communities, as well as the dissemination arm of the policies of either the Water Commission or the White House Council on Environmental Quality. The Blue Wave Network would be a private enterprise supported by and leveraging current platforms of public and private agencies, trade associations, and sector coalitions.

Timing: Day One
Proposal type: Executive Order

2. Develop a Water Workforce for the 21st Century.

Attracting and training the next generation of water and wastewater system operators is critically important, particularly for small and disadvantaged communities. Many water and wastewater utilities undertake the complex challenge of consistently delivering safe drinking water with a small and under-resourced staff with limited technical skills and training. Current estimates place the anticipated loss of utility employees at between 30% to 50% within the next 10 years due to the aging workforce in the water sector.

As a result, even large utilities will soon face loss of talented workers with the skills essential to the effective operation of their systems. Moreover, the introduction of new technologies will aggravate this problem for all utilities, because the operators of the future will need greater technological skills than are common today. But this challenge also presents an opportunity to create a talent pool utility managers and workers with sills for the 21st century.

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The Safe Drinking Water Act includes several set-asides related to operator certification and training for water systems from the funding authorized for the state revolving funds. Under that authority, the President should include in the charter for the Water Commission a directive to coordinate with the U.S. Department of Labor in developing a workforce development program helping American workers get the skills and credentials needed to support the operation, maintenance, and improvement of water and wastewater systems of tomorrow. This program would engage other key federal agencies including EPA, National Science Foundation, as well as innovative partnerships with state and local community colleges, to develop a blueprint for the overall professional development of water and wastewater operators. In addition, the Executive Order would direct the EPA Administrator to issue an update on how EPA and the states will implement the Capacity Development and Drinking Water State Revolving Fund (DWSRF) programs to equip the operators to address the water and wastewater challenges of the 21st century.

Timing: Day One
Proposal type: Executive Order

H. Promote Integrated Watershed Management and Planning.

Frequently, agencies and local officials only manage the water bodies near urban areas rather than upstream sources. Moreover, they often take their water from the source "as they find it" when it arrives at the treatment plant. As a result, when the water arrives for treatment it often contains severe contamination from upstream activities. This not only creates a public health threat, it also dramatically increases the costs to utilities to treat the water to safe standards. More effective management at the watershed level will significantly reduce operational costs to utilities and customers by limiting the amount of local water treatment necessary to ensure good water quality.

1. Codify EPA's Integrated Planning Process as An Option for Local Governments to Address their Wastewater and Stormwater Management Needs.

For years, communities have been told to achieve Clean Water Act mandates without any consideration of whether those requirements are feasible, affordable, or provide a significant environmental benefit. This problem is especially acute for separate sanitary sewer systems.

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To partially address this issue, H.R. 6182, the Water Quality Improvement Act, introduced in the last Congress, would allow local governments to prioritize and focus on their wastewater and storm water management needs with the greatest public health and environmental benefits. This legislation would codify EPA's Integrated Planning process as an alternative to facing costly consent decrees while establishing economic affordability criteria for the EPA to assess the financial capability of communities to implement control measures.

Timing: First 100 days
Action Type: Legislation
Proposal: See Exhibit 8

2. **Amend the Clean Water Act to Improve Federal Agency Coordination and Advance Integrated Water Resources Management (IWRM).**

Congress should codify integrated water resource management (IWRM) principles into the Clean Water Act (CWA) to promote greater coordination among federal agencies such as the Army Corp of Engineers, the Department of Agriculture, the Department of Interior, and EPA, which often pursue separate and sometimes conflicting agendas for water resource management. Amending the CWA to promote greater coordination through the Water Commission and IWRM would foster more coherent water management among relevant federal, state, and local authorities, thereby optimizing the use of water for agricultural, urban, and ecosystem needs.

Timing: First 100 days
Action Type: Legislation

3. **Reform the Agricultural Act of 2014 to Reduce Agricultural Runoff in Watersheds.**

Congress should reform the Agricultural Act ("Farm Bill") to upgrade water quality standards at the watershed level for runoff originating from agricultural areas that affect downstream water users. Existing laws do not adequately protect sources of drinking water from contamination by agricultural runoff, which includes pesticides, herbicides, or animal wastes, thus imposing greater treatment costs on downstream water utilities. Farmers should be encouraged to use existing

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incentive mechanisms to deploy best management practices to meet the standards.

Timing: First 100 days
Proposal type: Legislation

4. **Issue an Executive Order to Promote Greater Water Quality Trading (WQT).**

The EPA introduced WQT as a way to reduce water pollution from multiple sources in a more cost-effective manner. Entities are able to sell water quality credits to others that are not able to effectively reduce their pollution so that both entities are in compliance with CWA standards. WQT has already been used to good effect in the Chesapeake Bay, Great Lakes, and Gulf of Mexico areas. However, these trading markets have not fully developed in the United States, largely because WQT has not been codified by law or regulation.

Timing: First 100 days
Proposal type: Executive Order and Legislation

5. **Issue an Executive Order to Promote Water and Wastewater Regulatory Reform.**

One of the most important trends in water policy is integrated water use and reuse of wastewater, graywater, stormwater, produced water, brackish water, and ocean water. While the states are primarily responsible, the federal government could significantly advance progress by issuing an Executive Order on comprehensive, improved procedures for streamlining and reforming regulatory requirements regarding the design, construction, location, operation, and maintenance of water and wastewater infrastructure. Reforms should include the identification and removal of unnecessary, cross-cutting requirements, and incentives for better, faster, more coordinated reviews among agencies in evaluating technical, procedural, and substantive requirements, including cost and relevancy of standards and other requirements.

Another key reform measure would be to require the consideration of opportunity costs in assessing the economic toll of any new, proposed regulations. The true cost of compliance with a regulation not only includes the direct costs incurred, but also the loss of other opportunities because of the divergence of scarce resources. For example, burdensome recordkeeping or treatment requirements

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that do not materially improve public health might require the expenditure of thousands of dollars that could have been spent on infrastructure repairs or the addition of smart technologies that would have reduced water loss or otherwise improved efficiency. The benefits lost from those alternatives should be included in the calculation of the true cost of a new regulation, so that policy makers have a more accurate understanding of the consequences of regulations.

Timing: First 100 days
Proposal type: Executive Order

IV. MAKE AMERICA'S WATER INFRASTRUCTURE SAFER AND MORE SECURE

Americans must have confidence in the safety and reliability of their water supplies. Likewise, by promoting improved water management and greater cooperation on shared waters within the United States and internationally, we minimize the potential for disruptive conflicts over water, thereby strengthening America's security and economic interests at home and abroad.

A. Ensure Water Quality.

Over 300 million Americans rely on more than 50,000 community water systems to provide safe drinking water. Many small and disadvantaged communities face technical, managerial and financial capacity challenges that can complicate their efforts to sustainably provide safe drinking water to the populations they serve. The number and small scale of these systems is one of the single greatest challenges facing the U.S. drinking water system.

1. Improve Federal Agency Collaboration and Support for State and Local in Water Quality Research, Monitoring, and Data Collection.

Investing in research, monitoring and data allows Americans to identify and understand the true condition of the system and design strategies that are more safe, efficient and effective. This could provide cost savings to invest in other water infrastructure needs. As indicated in Section I above, as part of his Presidential Policy Directive and his charge to the Water Commission, the President should issue an Executive Order to improve collaboration and coordination across federal agencies such as EPA, Centers for Disease Control and Prevention, Departments of Agriculture, Energy, and Interior, and the National Oceanic and Atmospheric Administration. This Executive Order should also strengthen federal support for state and local efforts to

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integrate and analyze community drinking water quality data with public health data (such as childhood blood lead levels) and other key indicators. This could also include federal strategy for the research and application of science and technology to understand and address water quality challenges associated with providing safe drinking water.

Timing: Day One
Proposal type: Executive Order

2. **Issue an Executive Order to Develop a Knowledge and Information for Customers (KIC) Lead Program.**

The localized issues regarding lead contamination underscore the need to circulate best practices using currently available treatment and monitoring technologies and to develop and deploy better technologies over time. The President should issue an Executive Order instructing the EPA to develop a "Knowledge and Information for Customers (KIC) Lead Program." This program would enable the public to become better informed about what is known about the condition of their drinking water service lines. This program would include potentially matching funds to encourage consistent implementation at local levels. It would also use existing federal law on disclosure of lead paint risk as a template for similar required disclosure for the existence, or possible existence, of lead service lines.

KIC Lead would have three major components, comprising the "Lead in a Box" concept of reducing up-front implementation costs for local agencies:

- National GIS-based Lead Service Line Mapping Tool. The appropriate federal agency (e.g., HUD or EPA), would be tasked with developing a national lead mapping tool that can be populated with whatever information a local community has about lead service lines.
- National Free Lead Monitoring Kit. The appropriate federal agency, working through the states, would develop a system that would establish a model "kit" for a self-monitoring that end users can use to determine the safety of water at the tap. Citizens in communities with known lead service lines would each receive one free monitoring kit per year. The relevant federal agency would identify a network of labs to undertake the lab analysis at reduced bulk cost, and provide standardized information on what the lab results mean and appropriate next steps.

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- Enact a "lead in water" disclosure law. The Trump administration should work with Congress to develop legislation modeled after the Residential Lead-Based Paint Hazard Reduction Act of 1992, which protects families from exposure to lead from paint, dust, and soil. This new legislation could emulate Section 1018 of the 1992 law on lead paint, which directs HUD and EPA to require the disclosure of known information on lead-based paint and lead-based paint hazards before the sale or lease of most housing built before 1978. A new "lead in water" disclosure law should likewise establish specific disclosure requirements to be met prior to closure of a home sale or rental contract.

This KIC Lead program would enable home buyers or renters to access the best information possible about the condition of lead lines serving their homes. It would also enable them to take appropriate steps to avoid or reduce their risks to lead exposure in household water systems. This effort could be matched to potential funding targeted to KIC Lead from WIFIA and/or the Clean Water Revolving Fund.

Timing: Day One (for Executive Order) and first 100 days (Legislation)
Proposal type: Executive Order and Legislation

3. Replace, Fix, or Otherwise Remedy Contaminated Water Service Lines.

Service lines, including those made of lead, can be a major source of toxins entering households across the country. Service line ownership is typically split between the homeowner and the water system. An array of solutions exists for dealing with toxins in water, ranging from better treatment and system management to in-home filtration to full replacement of outdated service lines. Full replacement is very expensive, and replacing all lead service lines across the country could cost a total of approximately $30 billion. Many homeowners have limited discretionary funds to fund replacement of their lead service lines. Moreover, lower-income families tend to live in older housing units that are more likely to contain lead service lines, so the potential burden for a replacement program might disproportionally affect the poor.

In addition to facilitating better awareness as outlined above, Congress should consider providing financial assistance, particularly to low-income households, for help with installation of filtration systems or service line replacements, if needed. Specifically,

Congress could:

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- Enact tax credits or deductions for households below a certain income level who incur qualified costs for installation of in-home filtration systems or service line replacement to remove lead and other toxics from drinking water;
- Enact tax incentives for replacement of service lines or installation of in-home filtration systems to remove lead and other toxics from drinking water;
- Expand EPA and HUD real estate disclosure requirements to include whether a service line is present;
- Include lead in drinking water in the EPA and HUD's Lead-Safe Housing Rules;
- Adapt federal assistance programs such as the Federal Housing Administration (FHA) to allow people buying or refinancing homes to add the cost of full lead service line replacement to the mortgage without it counting against the loan-to-value maximums or to make lead service line replacement an eligible activity for rehab mortgage insurance under Section 203(k) or as a Title I insured loan for property improvements; and,
- Increase funding allocated to existing grant programs such as HUD's Community Development Block Grant program for targeting low-income households for purposes of lead service line remediation, either through filtration or replacement.

Timing: First 100 days
Proposal type: Legislation and Administrative Action by FHA, et al

4. **Clarify EPA Requirements for Stormwater Discharges from Municipal Water Facilities.**

The EPA should provide clear technology-based standards or an equivalent standard regarding stormwater discharges from municipal water facilities so that utilities can have greater certainty about compliance with EPA requirements.

Heavy precipitation elevates flows in water collection systems, which overwhelms treatment plants and causes them to discharge municipal stormwater directly to local waterways. The current Clean Water Act penalizes clean water utilities that cannot collect, transport, and treat wastewater in wet weather situations to the same standards that apply during dry weather. Combined sewer utilities are working to comply with the CWA's Combined Sewer Overflow (CSO) Control Policy. These utilities have benefited from a consistent national policy that outlines what is expected of them. However, the EPA continues to enforce a zero-overflow standard for sanitary

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sewer systems and has cracked down on peak wet weather treatment strategies like "blending" that were designed and funded with federal grants to provide the highest level of treatment to the greatest amount of flow. The EPA now views these flow management techniques as illegal bypasses and has pushed its regions and state permit writers to stop these practices. Thus, utilities need greater certainty and additional flexibility beyond EPA's current zero-overflow standard for sanitary sewer systems. Such certainty would eliminate large and costly enforcement orders from EPA obligating utilities to spending millions, and in some cases billions, of dollars to address wet weather challenges when more cost-effective options are available.

The EPA should use its existing regulatory authority under the CWA to adopt a more flexible approach and provide clear technology-based standards or an equivalent standard regarding stormwater discharges. To ensure greater certainty over the long-term, Congress should revise key sections of the CWA to make clear EPA permits sanitary sewer overflows under certain conditions and to clarify that EPA cannot dictate the type of treatment technology used at treatment plants to achieve federal secondary treatment requirements.

Timing: First 100 days
Proposal type: Administrative (EPA) and Legislation

B. Promote Global Water Security.

1. Establish a Center for Water Conflict Prevention and Resolution to Enhance National Security.

The United States can enhance national security and cooperation by managing and reducing conflict over water resources. Incorporating a stronger focus on global water challenges in the next National Security Strategy (NSS) would align U.S. government priorities across multiple agencies and leverage strategic advantages in diplomacy, development, defense, intelligence, science, and technology.

Congress should enact legislation establishing and funding a Center for Water Conflict Prevention and Cooperation. This Center is key to oversee and coordinate the strategic deployment of U.S expertise and resources. Through research and analysis, the Center will provide recommendations, as well as training and support, on policies, laws, and practices for conflict prevention and resolution on water issues. It will also convene multitrack "hydro-diplomacy" on transboundary basins with strategic value

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to the United States. Finally, it will assist in generating investment for projects by assisting in creating public-private partnerships to achieve resilient economies and communities.

Timing: First 200 days
Proposal type: Legislation

2. **Increase investment for improved Global Access to Water, Sanitation, and Hygiene (WASH).**

Congress should increase investments by $100 million per year beyond current appropriations across the U.S. government. This would have wide-reaching impacts on global water challenges, and increase opportunities for partnership and leveraged impacts among U.S. and non-U.S. partners. Effective U.S. foreign assistance could improve WASH access by mobilizing innovation and reducing future investments in military interventions and disaster assistance, and improved peace, stability, and improved livelihoods in countries important to the U.S. and our allies:

- Water security can help prevent the next droughts (unavoidable) from becoming the next famines (largely preventable).
- Water security can help prevent the next water-related diseases (e.g. cholera, Ebola) from becoming pandemics.
- Water security can lessen the likelihood, or mitigate the severity of local, national, and regional violent conflict.

Timing: First 100 days
Proposal type: Legislation

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Exhibit 1

DRAFT PRESIDENTIAL POLICY DIRECTIVE

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Introduction

Water powers the U.S. economy. Clean, safe water ensures the health and productivity of our people, provides more than 50 percent of the nation's total renewable energy, sustains our agricultural productivity and is critical to our economic development. America's water security rests on its infrastructure. These systems are comprised of the pipes, pumps, and purification systems that ensure we have clean water to drink; the multipurpose dams to provide electricity, protect against floods and droughts and ensure our waterways remain navigable; the desalination and wastewater treatment plants that can increase supplies and promote reuse; the in-house and on-farm technologies that reduce water use; and the space and land-based systems that allow us to monitor U.S. supplies and forecast potential challenges. This is the infrastructure that powers America, employs America and drives American economic growth and power.

Today, much of our water-related infrastructure is at risk. Many water supply systems are in desperate need of replacement. Water treatment systems cannot handle growing needs, are based on obsolete technologies, and are not equipped to meet the needs of many regions within the United States, which remain at risk for floods and droughts. Limited water resources are now becoming a significant impediment to our economic growth. As much as 25 to 30 percent of the treated water that goes into our distribution systems leaks into the ground as it flows through pipes installed 150 years ago. Those losses not only squander a vital and sometimes scarce resource, but also represent a massive waste of the energy and associated capital required to treat and pump that water.

Moreover, the physical and management infrastructure for water in the U.S. has major gaps, and the structure of the Country's public policy sometimes creates barriers to filling these gaps. The federal level of responsibility for water management is currently shared across approximately thirty agencies, ten departments and several independent commissions, councils and offices. There are several informal inter-agency coordination mechanisms, which have had limited success.

Water beyond America's borders is also an issue of U.S. National Security concern. When communities globally do not have ample clean water, there is poor health, failing economies, and regional instability. People should have access to the water they need, when they need it, where they need it, without living in fear of floods and droughts, public health risks, or conflict. This

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directive recognizes America's responsibilities and opportunities to share our know-how, technologies, and approaches with countries in need across the globe.

This Presidential Policy Directive will make achieving the nation's water security through sound infrastructure a priority – contributing to a more healthy, prosperous and resilient America. An important first step will be the creation of a Presidential Commission on Water Infrastructure Policy Coordination and Security ("the Water Commission"), which will develop a structure and process to break down the policy silos and create a coordinated, rational, and efficient water policy and administration, to include better collaboration and coordination across federal agencies. In addition, since water is also a major national security issue, the U.S. it must also examine its water policy through the lens of U.S. national and economic security. The Water Commission will convene leading experts to develop an immediate plan to improve and enhance water infrastructure and security, and should report its recommendations within 180 days of formation and thereafter oversee long-term federal agency coordination and policy implementation.

Policy

It is the policy of the United States to make water security a domestic and international national priority. People should have access to the water they need, when they need it, where they need it, without living in fear of floods and droughts or public health risks or conflict. This effort includes, but is not limited to, water for drinking and domestic use, water for agriculture, water for energy, water for industry, water for navigation, and water for health.

Key U.S. Water Principles

This water initiative will follow certain key principles:

- **Support for local communities** – The federal government will speak with one voice and be a source of reliable support to states and local communities. Our federal water infrastructure programs, regulations, and rules are currently spread across multiple agencies with little or no coordination or rationalization. They will be reorganized to make them more coherent, coordinated, rational, effective, and economical, and to encourage local autonomy and decision-making.
- **Invest in our water infrastructure** – We must adequately fund and support our existing federal programs to ensure communities and utilities have the resources necessary to operate and maintain their systems.
- **Leverage and promote access to private capital** – Because public funds alone will not solve these challenges, a coordinated federal action agenda will be designed to increase the level of private sector investment in water infrastructure.

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- **Ensure safe, reliable and affordable service** – American water systems must be safe, reliable, and achieve fair pricing (full cost recovery) so that no one is left without reliable water services simply because they cannot afford it.
- **Support for American workers and manufacturing** – As we build and rebuild our water infrastructure, we should support our fellow citizens by Buying and Hiring American, using American tax dollars to support American jobs and industry.
- **Catalyze technology innovation** – Federal agencies will support the accelerated deployment of the best innovative technologies and support small community access to the most appropriate technologies to meet their needs.
- **Data collection and dissemination for sound water management** – Collect, strengthen and ensure access to timely forecasting data and information on the state of the nation's water resources.
- **Utilize global water security to drive U.S. economic growth and national security** – Make water security a foreign policy and foreign assistance priority that increases the exports of American technologies and approaches.

A Global Water Security Strategy

As we invest in a U.S. water infrastructure that employs the most innovative ideas and technologies, and serves every individual and community in this country, we need to apply our experience and expertise to partner with people in countries important to the U.S. who are also suffering from water insecurity. Today, approximately 1.8 billion people lack access to water that is safe to drink and nearly 2 billion people lack access to sanitation. Water-related diseases worldwide are the second leading cause of death in children and a major cause of physical and cognitive stunting. Water scarcity and poor water quality will undermine economic growth, limit food production and become an increasing threat to peace and security in many regions of the world where the United States has strong strategic interests. The United States can leverage its own experience and technologies to create a more water secure world and generate new opportunities for U.S. businesses overseas.

As required by law, the administration will develop, by October 2017, a U.S. Government Global Water Strategy to improve water security internationally by increasing access to safe drinking water and sanitation, improving water resources management, and promoting cooperation on shared waters. This initiative directs the U.S. State Department to take the lead on the development of the Global Water Security Strategy, in close coordination with the U.S. Agency for International Development and all relevant agencies.

Immediate Actions, Roles and Responsibilities

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This water initiative will be charged with acting within a tight time frame. Accordingly, the administration is taking a series of immediate Executive actions to begin to address gaps that are leaving people underserved, to accelerate private investment, increase jobs, improve the efficiency, reliability, and performance of our infrastructure, deploy innovative technologies, and build public-private partnerships. To create and sustain long-term improvements, set forth here are a set of immediate steps needed to develop a more detailed action plan within 180 days:

- **Establish the Presidential Commission on Water Infrastructure Policy Coordination and Security** – The Water Commission will develop recommendations for a long-term structure and process to break down the policy silos and create a coordinated, rational, and efficient water policy and administration, to include better collaboration and coordination across federal agencies on domestic and international water policy. The Water Commission will be modeled after the 1973 U.S. Water Commission as an independent, bipartisan body that would drive a policy discussion and provide oversight for a national strategic plan for water investments.
- **Provide dedicated staffing** – Create the post of Assistant to the President for Water Policy and Security, reporting to the White House Chief of Staff. The President will empower this staff to coordinate and support the activities of the Water Commission, integrate federal agency responsibilities, listen to America's communities, consumers, businesses, and investors, and rapidly develop and implement action steps to achieve the above objectives. The Assistant would oversee all U.S. activities addressing or supporting programs designed to improve water infrastructure and security and has the authority to coordinate, convene, and mobilize U.S. government agencies when responding to the diverse issues associated with water nexus challenges including, but not limited to, energy, food, health, trade, and transboundary cooperation.

This Water Commission will consist of key federal agencies, state and local representatives as well as leading thinkers in the private, nonprofit and financial communities and be co-chaired by the President's National Security and Economic Policy Advisors. It will be sharply focused on developing a structure and process for the achievement of the following objectives:

- Develop a set of national objectives to ensure that all agency approaches to protecting water resources, maintaining our water infrastructure, and providing safe, reliable, and affordable drinking water are fully coordinated.
- Establish a formal inter-agency coordination process across all federal domestic and international agencies with jurisdiction over water management and water security.
- Reorganize and streamline the diverse federal water responsibilities, laws, and regulations, including better coordination among energy, water, and food policies.

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- Convene a White House Water Summit to receive feedback from key sector experts to begin developing the action plan.
- Identify the root cause of why private sector business and private capital are not more effectively deployed in water projects and needed water investments and develop policies to eliminate those barriers. Propose long-term approaches to encouraging more private investment and public-private partnerships.
- Ensure the many existing innovative technologies that allow us to do more with less can be verified and deployed on a much faster track.
- Align all the activities of federal agencies around a sound, risk-based approach to protecting watersheds, to ensure that we are focused on the priority threats and risks and avoid focusing on things that do not work.
- Incentivize regional planning processes and full cost accounting to encourage more integrated long-term strategic approaches, innovation and engagement with local stakeholders.
- Establish a peer-to-peer network among local water utilities to share information and best practices to improve performance.
- Recommend the best ways to make U.S. expertise and technology available to international citizens and markets and to encourage foreign investment in U.S. infrastructure, technologies, products and services, including public-private partnerships and cognitive learning platforms.
- Enhance and improve basic water science and data collection.
- Identify ways to modernize water-quality laws, in particular the Clean Water Act and the Safe Drinking Water Act.
- Provide recommendations on water security and infrastructure to be included in the annual National Security Strategy process.
- Task the U.S. State Department, working with the U.S. Agency for International Development and other agencies and stakeholders as appropriate, to develop and implement the Global Water Security Strategy.

The Water Commission will be required to provide a detailed action agenda within 180 days and a long-term national strategic plan for water investments by no later than December 31, 2017. This will include both specific Executive actions, legislative recommendations, and a plan to ensure the best possible coordination among the federal, state and local bodies responsible for water with full accountability.

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Exhibit 2

DRAFT EXECUTIVE ORDER

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ESTABLISHMENT OF THE PRESIDENTIAL COMMISSION ON WATER INFRASTRUCTURE POLICY COORDINATION AND SECURITY AND ASSISTANT TO THE PRESIDENT FOR WATER POLICY AND SECURITY

By virtue of the authority invested in me as President of the United States, it is ordered as follows:

Section 1: Establishment-

There is hereby established in the Executive Office of the President a Commission, which shall be known as the Commission on Water Infrastructure Policy Coordination and Security ("the Water Commission").

Section 2: Membership-

(a) This Water Commission shall be staffed by an Assistant to the President for Water Policy and Security, reporting directly to the White House Chief of Staff. The Assistant would oversee all U.S. activities addressing or supporting programs designed to improve water infrastructure and security and has the authority to coordinate, convene, and mobilize U.S. government agencies when responding to the diverse issues associated with water nexus challenges including, but not limited to, energy, food, health, trade, and transboundary cooperation.

(b) The Water Commission shall be composed of no fewer than 11 but not more than 17 non-federal government members who shall be appointed by the President upon recommendation by the Chair. The members shall be drawn from among distinguished individuals, and may include those with experience in or representing the scientific, engineering, and environmental communities, the water sector, or any other area determined by the President to be of value to the Water Commission in carrying out its duties. To ensure proper federal representation in coordination, the Water Commission shall include the following federal government organization leaders or their designees as Ex-Officio members or Special Government Employees, depending on specific expertise:

- Secretary of Agriculture

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- Secretary of Commerce
- Secretary of Defense
- Secretary of Energy
- Secretary of Homeland Security
- Secretary of Interior
- Secretary of State
- Secretary of Transportation
- Secretary of Treasury
- Administrator of the Environmental Protection Agency
- Administrator of the National Oceanic and Atmospheric Administration
- The U.S. Army Corps of Engineers

The non-governmental members shall include representatives from the following areas of expertise:

- State government
- Local government
- Private sector companies
- Civil society, academic, and associations
- Financial and banking community
- President of the National Academies of Science, Engineering and Medicine

Membership must meet the balance membership plan specified under the Federal Advisory Committee Act (FACA).

(c) The initial members of the Commission shall be:

(d) The President designates _____and the Assistant to the President for Water Policy and Security and the Executive Assistant to serve as the Water Commission's Co-Chairs.

Section 3: Mission and Work-

(a) The Water Commission shall develop a national strategy for water infrastructure investment and water security to include key economic, public health and safety, and

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national security considerations. Mobilizing and aligning U.S. government agencies, the private sector, and civil society organizations will break down existing silos and ensure efficient coordination and implementation across the water sector.

(b) The Water Commission shall develop recommendations for long-term coordination across the approximately thirty agencies, ten departments and several independent commissions and offices currently responsible for water resources and infrastructure management, including options involving:

1) Improvements to federal laws, regulations, and industry practices to promote more effective coordination of federal policy and financial support for state and local agencies with primary responsibilities in the water sector.

2) More effective, locally –directed, and coordinated actions to improve protection of public health and safety, promote economic growth, commerce, and national security, and to better protect and respond to situations where flood risks exist, water supplies are threatened or whose quality presents any health or safety issue to affected communities.

3) Organizational or other reforms of federal agencies or processes necessary to ensure such potential improvements are identified, implemented and maintained.

(c) The Water Commission shall identify, evaluate, and recommend actions necessary to improve access to the knowledge needed to make informed water infrastructure and water security management decisions, demonstrate the nature and severity of water security threats to our nation and worldwide, and develop partnerships with industry, civil society, and international stakeholders to maximize the economic and national security benefits of our actions. The Water Commission will give particular consideration to the following key issues:

1) Develop a set of national objectives to ensure that all agency approaches to protecting water resources, maintaining and improving our water infrastructure, and providing safe, reliable, and affordable drinking water are fully coordinated.

2) Establish a formal inter-agency coordination process across all federal, domestic, and international agencies with jurisdiction over water management and water security.

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3) Reorganize and streamline the diverse federal water responsibilities, laws, and regulations, including better coordination among energy, water, and food policies.

4) Convene a White House Water Summit to receive feedback from key experts and stakeholders and to receive input and commitments.

5) Identify root causes of why private sector business and private capital are not more effectively deployed in water projects and needed water investments and developing policies to eliminate those barriers.

6) Ensure that the many existing innovative technologies can be verified and deployed on a much faster track.

7) Align all the activities of federal agencies around a sound, risk-based approach to protecting watersheds, to ensure that we are focused on the priority threats and risks, (i.e., reducing risks to floods and droughts) and avoid focusing on things that do not work.

8) Incentivize regional planning processes (i.e., integrated water resources management), local management autonomy, and full cost accounting to encourage more integrated long-term strategic approaches, innovation, and engagement with local stakeholders.

9) Establish a peer-to-peer network among local water utilities and among flood and stormwater water management bodies to share information and best practices to improve performance.

10) Recommend the best ways to make U.S. water planning and management expertise and technology available to international citizens and markets and to encourage foreign investment in U.S. infrastructure, technologies, products and services, including public-private partnerships and cognitive learning platforms.

11) Enhance and improve basic water science and data collection.

12) Identify ways to modernize water-quality laws, in particular the Clean Water Act and the Safe Drinking Water Act.

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13) Provide recommendations on water security and infrastructure to be included in the annual National Security Strategy process.

14) Task the U.S. State Department, working with the U.S. Agency for International Development and other agencies and stakeholders as appropriate, to develop and implement the Global Water Security Strategy, as required under the Senator Paul Simon Water for the World Act.

(d) Where appropriate, the Water Commission may conduct original research, direct studies, and hold hearings to further examine particular issues.

(e) Submit an initial action agenda to the President with its findings and options for consideration within 90 days of the date of the Water Commission's first meeting.

(f) The Water Commission shall be advisory in nature and shall submit the national strategy to the President by no later than December 31, 2017. This strategy shall be published on a public website along with any appropriate response from the President within 45 days after it is provided to the President.

Section 4: Administration-

(a) The Water Commission shall hold periodic meetings in public forums in an open and transparent environment.

(b) In carrying out its mission, the Water Commission shall be informed by, and shall strive to avoid duplicating, the efforts of other governmental entities.

(c) The Water Commission shall have a staff, headed by an Assistant to the President for Water Policy and Security, which shall provide support for the functions of the Commission. The President shall appoint this senior staff, who shall be a full-time federal employee, and the Water Commission's staff. The Assistant to the President may also serve as the Designated Federal Officer in accordance with the Federal Advisory Committee Act, as amended, 5 U.S.C. App. (FACA, the "Act").

(d) The Assistant to the President, in consultation with the Co- Chairs, shall have the authority to create subcommittees as necessary to support the Commission's work and to examine particular areas of importance. These subcommittees must report their work to the Water Commission to inform its final recommendations.

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(e) The Co-Chairs will work with the heads of Executive departments and agencies, to the extent permitted by law and consistent with their ongoing activities and in accordance with their membership in the Water Commission, to provide the Water Commission such information and cooperation as it may require for purposes of carrying out its mission and ensure effective federal coordination of key water infrastructure and security policy priorities.

(f) The non-federal members will meet with federal members to provide advice and input to meet national water infrastructure and security objectives,

Section 5: General Provisions-

During the Fiscal Year 2017, the commissioners shall serve without compensation other than travel expenses and per-diem allowances. The Office of Management and Budget shall initially determine the source of funding and the first budget of the President will request Congress to empower and resource the Water Commission in the White House, elevating its stature to an important role as an inter-agency coordination mechanism.

(a) To the extent permitted by law, and subject to the availability of appropriations, the President directs the Director of Office of Management and Budget to provide the Commission with such expertise, services, funds, facilities, staff, equipment, and other support services as may be necessary to carry out its mission.

(b) Insofar as FACA may apply to the Water Commission, any functions of the President under that Act, except for those in Section 6 and Section 14 of that Act, shall be performed by the Assistant to the President.

(c) Members of the Water Commission shall serve without any compensation for their work on the Water Commission, but shall be allowed travel expenses, including per diem in lieu of subsistence, to the extent permitted by law for persons serving intermittently in the Government service (5 U.S.C. 5701-5707).

(d) Nothing in this order shall be construed to impair or otherwise affect:
    1) The authority granted by law to a department, agency, or the head thereof;
    2) The functions of the Director of the Office of Management and Budget relating to budgetary, administrative, or legislative proposals;
    3) The existing authorities of state and local governments to administer water quality laws to protect public health and safety.

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Section 6: Cooperation-

All Executive departments and agencies of the federal government are authorized and directed to cooperate with the Water Commission in its work and to furnish the Water Commission with such information and assistance as it may require in the performance of its duties.

Section 7: Termination-

The Water Commission shall terminate within two years of the initial meeting, unless extended by the President.

DONALD J. TRUMP

THE WHITE HOUSE,
March 22, 2017.

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Exhibit 3

LEGISLATIVE ACTION

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PRIVATE ACTIVITY BONDS

Enact legislation to remove the volume cap from private activity bonds for water and wastewater facilities. Such legislation was most recently introduced as "The Sustainable Water Infrastructure Investment Act of 2015" in the 114th Congress (H. R. 499 and S. 2606), and similar legislation has been introduced in previous Congresses. In each instance it had broad bipartisan support, one year with more than 100 co-sponsors.

The purpose is to provide cost-effective, alternative financing for long-term water infrastructure capital investment programs, to restore the nation's safe drinking water and wastewater infrastructure capability, and protect the health of our citizens.

(1) Our nation's water and wastewater systems are among the best in the world, providing safe drinking water and sanitation to our citizens.
(2) In addition to protecting the health of our citizens, community water systems are essential to our local economies, enabling industries to achieve growth and productivity that make America strong and prosperous.
(3) Regulated under title XIV of the Public Health Service Act (42 U.S.C. 300f et seq.; commonly known as the "Safe Drinking Water Act") and the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.), community drinking water systems and wastewater collection and treatment facilities are critical elements in the nation's infrastructure.
(4) Water and wastewater infrastructure is comprised of a mixture of old and new technology. In many local communities across the nation, the old infrastructure is at or near the end of its intended life cycle, has deteriorated to critical conditions and is very costly to replace. Recent government studies have estimated costs of $500,000,000,000 to $800,000,000,000 over the next 20 years for maintaining and improving the existing inventory, building new infrastructure, and meeting new water quality standards.
(5) The historical approach of funding infrastructure is insufficient to meet the investment needs of the future.
(6) The federal partnership with State and local communities has played a pivotal role in improving the nation's water quality and drinking water supplies. Federal assistance under this partnership has been the linchpin of these improvements.
(7) In light of constrained federal budgets, the availability of exempt-facility financing represents an important financing tool to help close the gap between funds currently being invested and water infrastructure needs, preserving the federal partnership.

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(8) Providing alternative financing solutions, such as tax-exempt securities, encourages investment in water and wastewater infrastructure that in turn creates local jobs and protects the health of our citizens.
(9) Federally mandated State volume cap restrictions in conjunction with other priorities have limited the use of tax-exempt securities on water and wastewater infrastructure investment.
(10) Removal of State volume caps for water and wastewater infrastructure will accelerate and increase overall investment in the nation's critical water infrastructure; facilitate increased use of innovative infrastructure delivery methods supporting sustainable water systems through public-private partnerships that optimize design, financing, construction, and long-term management, maintenance and viability; and provide for more effective risk management of complex water infrastructure projects by municipal utility and private sector partners.

Exempt-facility bonds for sewage and water supply facilities

(a) Bonds for water and sewage facilities exempt from volume cap on private activity bonds
Paragraph (3) of section 146(g) of the Internal Revenue Code of 1986 is amended by inserting (4), (5), after (2),.
(b) Conforming change
Paragraphs (2) and (3)(B) of section 146(k) of the Internal Revenue Code of 1986 are both amended by striking (4), (5), (6), and inserting (6).

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Exhibit 4

EXECUTIVE ORDER

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REMOVAL OF FEDERAL BARRIERS TO PRIVATE CAPITAL INVESTMENT IN U.S. INFRASTRUCTURE

By the authority invested in me as President by the Constitution and the laws of the United States of America, and to aid in the removal of federal barriers to private capital investment in U.S. infrastructure:

Section 1. Policy. Infrastructure investment strengthens our economic platform, makes America more competitive, creates millions of jobs, increases wages for American workers, and reduces the costs of goods and services for American consumers. America's infrastructure is a linchpin of private sector growth but, today, much of our infrastructure is crumbling.

More than 60,000 bridges are considered "structurally deficient." Traffic delays cost the U.S. economy more than $50 billion annually. Most major roads are rated as "less than good condition."

An investigation by USA Today "identified almost 2,000 additional water systems spanning all 50 states where testing has shown excessive levels of lead contamination over the past four years." This included 350 systems that supplied drinking water to schools or day care facilities.

According to the National Association of Manufacturers (NAM), without major improvements to our transportation systems, "the United States will lose more than 2.5 million jobs by 2025" (NAM, Build To Win, 2016). NAM estimates a "ten-year funding gap" of approximately $1 trillion. The Trump Infrastructure Plan is aimed at achieving a target of investment to fill this gap. NAM also found that $8 billion in infrastructure tax credits would support $226 billion in infrastructure investment over 10 years. Innovative financing programs also provide a 10-to-1 return on investment.

Under current policies, infrastructure projects across the U.S. are routinely delayed for years and years due to endless studies, layer-upon-layer of red-tape, bureaucracy, and lawsuits—with virtually no end in sight. This increases costs on taxpayers and blocks Americans from obtaining the kind of infrastructure that is needed for them to compete economically.

According to the Wall Street Journal, "more than a dozen [energy infrastructure] projects, worth about $33 billion, have been either rejected by regulators or withdrawn by developers since 2012, with billions more tied up in projects still in regulatory limbo." This includes coal and shale energy export facilities. Major pipelines are being blocked as well. As noted in the Wall Street Journal, blocking such projects "leaves some communities without access to lower-cost fuel and higher-paying jobs."

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Global infrastructure investment funds, insurance companies, and U.S. pension funds are eager to invest in such projects in this country, as they have been doing overseas in recent years. However, a number of federal barriers limit the use of private capital to rebuild and modernize infrastructure that is owned and operated by state and municipal governments. A wide array of long-established government policies favor traditional procurement and traditional government ownership, operation, and maintenance of infrastructure facilities. Among the most important are tax policies.

Accordingly, to further the Administration's priority of improving our nation's crumbling infrastructure, it is imperative that we remove federally created barriers to private investment in U.S. infrastructure.

Section 2. Removal of regulatory tax barriers to investment in infrastructure. The Secretary of the Treasury is hereby directed to eliminate barriers to investment in infrastructure by modifying and clarifying certain provisions of the regulations and other administrative guidance applicable to tax-exempt bonds.

Language for OMB Memorandum on Infrastructure Tax Proposals

Consistent with Executive Order [ ] the Secretary of the Treasury is hereby directed to take the following actions:

1. Modify Revenue Procedure 2016-44 regarding management contracts to eliminate remaining barriers to public private partnerships. Specific changes to be considered include the following:

    a. Limit on contract term. Eliminate the 30-year limitation on the term of permitted management contracts and clarify that the 80 percent of useful life limitation may take into account contractual "return conditions" on the property (for example, a requirement that the manager return the property in good, operating condition).

    b. Limits on compensation. Permit compensation to include compensation based on both revenues and expenses as long as such compensation is not effectively a share of net profits. In conjunction with this change, consider a change to Treas. Reg. § 1.141-3, which contains an outright prohibition on sharing of net profits, to permit a modest sharing of net profits (e.g., up to 10 percent) with the manager in a contract that otherwise qualifies as a "good" management contract.

    c. Governmental control. Modify the requirement that the governmental entity retain significant control over the property to clarify that such control can be established through requirements in the contract regarding the manner in which the facility is to be operated, maintained, insured, etc. and that if such requirements are in place it is not necessary for the governmental entity to approve annual budgets or rates charged.

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d. Risk of loss. Clarify that the requirement for the governmental entity to bear the risk of loss on the property can be satisfied through a contractual requirement placed on the manager to insure against such losses.

2. Modify the remedial action requirements of Treas. Reg. § 1.141-12

Treas. Reg. § 1.141-12 permits the tax-exempt status of outstanding bonds to be maintained in the context of a disposition of a facility entirely for cash if the cash is used for other qualifying purposes. The regulations should be modified to clarify that the "alternative use of disposition proceeds" remedial action is available in the case of leases, concessions, and operating agreements. The clarification would eliminate the necessity to redeem or defease tax-exempt bonds in the context of post-issuance changes of use of the bond-financed property, such as may occur in the context of a public private partnership transaction. Specific changes to be considered include the following:

a. Definition of "disposition proceeds." The definition of "disposition proceeds" in Treas. Reg. § 1.141-12(c)(1) should be broadened to include amounts derived from a lease, concession, or operating agreement if the arrangement does not have the effect of transferring to the new user of the property ownership of the property.

b. Allocating disposition to an issue. Technical clarification to delete the second sentence of Treas. Reg. § 1.141-12(c)(2) so that the paragraph would provide a uniform rule for dispositions other than sales.

c. Cash consideration requirement. The cash-consideration requirement in Treas. Reg. § 1.141-12(e)(1)(i) should be revised to require the consideration to be exclusively cash, paid either at the time of the sale or exchange or later pursuant to the terms of a lease, concession, or operating agreement.

d. Timing of expenditures. The two-year expenditure requirement in Treas. Reg. § 1.141-12(e)(1)(ii) should be revised to require that the issuer reasonably expect to expend the cash disposition proceeds within two years of the disposition or, if later, within two years of the receipt of each payment of cash from the disposition.

e. Defeasance requirement. For situations that do not qualify for the "alternative use of disposition proceeds" remedial action, eliminate the requirement to defease the outstanding bonds but continue to require that the affected bonds be retired on their first call date.

3. Issue Guidance Related to Municipal Pension Funds

Clarification of the treatment of governmental pension funds would permit access to an additional source of capital for infrastructure that is not currently available without tainting

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outstanding tax exempt bonds or preventing the use of additional tax exempt bonds for future improvements.

a. Include government pension funds in definition of instrumentalities.

Regulations under section 141 of the Internal Revenue Code provide that an instrumentality of a governmental unit is treated as not creating private business use. The only definition of "instrumentality" is contained in Revenue Ruling 57-128, which contains a six-factor test that the IRS has applied in a variety of contexts to identify agencies or instrumentalities. Although the IRS has issued numerous private letter rulings applying the six-factor test, there is little guidance applying this Revenue Ruling in the context of municipal pension funds. Guidance should be issued clarifying that a governmental pension fund is an instrumentality of the associated governmental unit so as to be treated as a "governmental person" for private activity bond purposes.

b. Exclude interests acquired by government pension funds in public infrastructure projects from definition of investment-type property.

As part of the Tax Reform Act of 1986, the term "investment type property" was added to the Code to broaden the types of investments that are subject to the arbitrage rules. Treas. Reg. § 1.148-1(e)(1) states that investment property includes any property that is held principally as a passive vehicle for the production of income. If the acquisition of an infrastructure asset by a public pension fund is treated as investment-type property, the related bonds could be characterized as arbitrage bonds. The regulations should clarify that the acquisition of an interest by a public pension fund in a public infrastructure project would not be treated as investment type property.

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Exhibit 5

LEGISLATIVE ACTION

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DRAFT LANGUAGE FOR THE LOW-INCOME WATER ASSISTANCE PILOT PROGRAM

H. R. XXXX

To amend the Safe Drinking Water Act to establish a low-income water assistance pilot program.

IN THE HOUSE OF REPRESENTATIVES
January XX, 2017
Mr. _____ introduced the following bill; which was referred to the Committee on Energy and Commerce.

A BILL
To amend the Safe Drinking Water Act to establish a low-income water assistance pilot program.
Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,
SECTION 1. SHORT TITLE.
This Act may be cited as the "Low Income Water Assistance Program Act of 2017".
SEC. 2. LOW-INCOME WATER ASSISTANCE PILOT PROGRAM.
Title XIV of the Safe Drinking Water Act (42 U.S.C. 300 et seq.) is amended by adding at the end the following:
"SEC. 1459. LOW-INCOME WATER ASSISTANCE PILOT PROGRAM.
"(a) Establishment.—The Administrator shall establish a pilot program to award grants to not fewer than 10 eligible entities to assist low-income households in maintaining access to drinking water services.
"(b) Report.—Not later than one year after the date of enactment of this section, the Administrator shall submit to Congress a report on the results of the program established under this section.
"(c) Definitions.—In this section:
"(1) ELIGIBLE ENTITY.—The term 'eligible entity' means a municipality or a public entity that owns or operates a public water system, that is affected by a consent decree relating to compliance with this Act.
"(2) HOUSEHOLD.—The term 'household' means any individual or group of individuals who are living together as one economic unit.

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"(3) LOW-INCOME HOUSEHOLD.—
"(A) IN GENERAL.—The term 'low-income household' means a household—
"(i) in which 1 or more individuals are receiving—
"(I) assistance under a State program funded under part A of title IV of the Social Security Act;
"(II) supplemental security income payments under title XVI of the Social Security Act;
"(III) supplemental nutrition assistance program benefits under the Food and Nutrition Act of 2008; or
"(IV) payments under section 1315, 1521, 1541, or 1542 of title 38, United States Code, or under section 306 of the Veterans' and Survivors' Pension Improvement Act of 1978; or

"(ii) that has an income determined by the State in which the eligible entity is located to not exceed the greater of—
"(I) an amount equal to 150 percent of the poverty level for the State; or
"(II) an amount equal to 60 percent of the State median income; and
"(B) LOWER INCOME LIMIT.—For purposes of this section, a State may adopt an income limit that is lower than the limit described in subparagraph (A)(ii), except that the State may not exclude a household from eligibility in a fiscal year solely on the basis of household income if such income is less than 110 percent of the poverty level for such State.
"(4) PUBLIC WATER SYSTEM.—The term 'public water system' has the meaning given that term in section 1401 of the Safe Drinking Water Act (42 U.S.C. 300f).
"(d) Cost Sharing Requirements.—As a condition on the receipt of funds, eligible entities that receive funds under this section shall provide a 67 percent match.
"(e) Terms and limitations – The amount of funding received by an eligible entity under this section shall not exceed 33 percent of program costs."

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Exhibit 6

DRAFT EXECUTIVE ORDER

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ENHANCED EXPORT INITIATIVE FOR WATER AND WASTEWATER TECHNOLOGIES AND SERVICES

By the authority vested in me as President by the Constitution and the laws of the United States of America, including, inter alia, the Export Enhancement Act of 1992 and 15 U.S. Code 4727 and 4728, in order to advance global water security and to enhance and coordinate federal efforts to facilitate the creation of jobs in the United States through the promotion of exports of technologies and services related to water and wastewater, and to ensure the effective use of federal resources in support of these goals, it is hereby ordered as follows:

Section 1. Policy. Creating jobs in the United States and promoting water security in the United States and internationally are top priorities for my administration. The United States is a world leader in technological innovation and in promoting a holistic approach to water and wastewater management. Ensuring that American businesses can actively and fairly participate in international markets for water and wastewater-related technologies, goods and services will help other countries to meet growing demands for water and sanitation services, thereby enhancing public health, agricultural productivity, and other developmental objectives. At the same time, expanding exports of American goods and services in the water and wastewater sector will, in turn, create good high-paying jobs in the United States.

The Enhanced Export Initiative for Water and Wastewater Technologies and Services shall be an administration initiative to improve the private sector's ability to export American expertise and products in this vital sector of the U.S. and global economy. This initiative will work to reduce and, where possible, eliminate trade barriers abroad, by helping firms -- especially small businesses -- overcome the hurdles to entering new export markets, by assisting with financing, and by promoting a coordinated "whole of United States" approach to export advocacy for water and wastewater-related goods and services.

Sec. 2. Water and Wastewater Technologies and Services Sub-Working Group. There is established Water and Wastewater Technologies and Services Sub-Working Group under the existing Environmental Trade Working Group (ETWG) of the Trade Promotion Coordination Committee (TPCC) established under 15 U.S. Code Section 4727. This Sub-Working Group will develop and coordinate the implementation of this initiative to increase the export of U.S. goods and services in water and wastewater. It shall be Chaired by the Assistant to the President for Water Resources and Water Security and include senior representatives from:

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(a) the Department of State;
(b) the Department of Commerce;
(c) the Department of the Treasury;
(d) the Department of Agriculture;
(e) the Department of The Interior;
(f) the United States Trade Representative;
(g) the Millennium Challenge Corporation;
(h) the U.S. Agency for International Development;
(i) the Director of the Office of Management and Budget;
(j) the Environmental Protection Agency;
(k) the Export-Import Bank of the United States;
(l) the Small Business Administration;
(m) the Overseas Private Investment Corporation;
(n) the United States Trade and Development Agency; and,
(o) representatives of other departments and agencies that are part of the existing TPCC.

The Sub-Working Group shall meet periodically and report through the ETWG and TPCC to the President on the progress of this Initiative.

Sec. 3. Enhanced Export Initiative for Water and Wastewater Technologies and Services. This Initiative shall address the following:

(a) Federal Export Assistance. The Sub-Working Group shall identify and promote ways to coordinate and direct effectively U.S. export financing offered by the EXIM Bank, OPIC, and USTDA, to assist U.S. providers, particularly Small and Medium-Sized Enterprises, in pursuing new or expanded export opportunities in the water and wastewater sector.
(b) Trade Missions. The Commerce Department, in consultation with the State Department and other TPCC members, as well as relevant state and local officials, and the private sector, shall ensure that U.S. Government-led trade missions include, where appropriate, an emphasis on export opportunities for U.S. providers of water and wastewater technologies, goods and services. "Reverse" trade missions of international decision makers to engage U.S. water and wastewater technology, product, and service providers to see U.S. experiences should also be considered.
(c) Commercial Advocacy. The Advocacy Center at the Department of Commerce, in consultation with the State Department, shall ensure that the federal government's overseas commercial advocacy programs include, where appropriate, emphasis on export opportunities for U.S. providers of water and wastewater technologies, goods and services.

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(d) Reducing Barriers to Trade. The United States Trade Representative, in consultation with Commerce, State, and other members of the Sub-Working Group, shall take steps to improve market access overseas for American providers of water and wastewater technologies, goods and services by actively opening new markets, reducing significant trade barriers, and robustly enforcing relevant trade agreements.

Sec. 4. General Provisions.

(a) Nothing in this order shall be construed to impair or otherwise affect:

(i) authority granted by law to an executive department, agency, or the head thereof, or the status of that department or agency within the federal government; or

(ii) functions of the Director of the Office of Management and Budget relating to budgetary, administrative, or legislative proposals.

(b) This order shall be implemented consistent with applicable law and subject to the availability of appropriations.

(c) This order is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable at law or in equity by any party against the United States, its departments, agencies, or entities, its officers, employees, or agents, or any other person.

DONALD J. TRUMP

THE WHITE HOUSE,
March 22, 2017.

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Exhibit 7

LEGISLATIVE ACTION

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DRAFT LANGUAGE FOR RESEARCH TEST BED NETWORK AND DIGITAL SOLUTIONS

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.
This Act may be cited as the "Water Research and Technology Test Bed Act".
SEC. 2. FINDINGS.
Congress finds that—
(1) communities across the United States face threats to their drinking water systems and therefore to public health, and these threats are exacerbated by the need for advancements in technological solutions, such as the ability to test water in real time, as well as to filter, monitor, and deliver clean water in response to changing contaminants;
(2) wastewater treatment in the municipal, industrial, and agricultural sectors is energy-intensive and costly in both infrastructure and operational costs, and is in need of advancements in technological solutions to meet these challenges in a cost-effective manner;
(3) water supply and water quality challenges create acute pressures across the United States, such as—
(A) in 2014, as much as 57 percent of the continental United States experienced abnormally dry or drought conditions, which were serious, but not unprecedented, conditions; and
(B) wetter regions are challenged by water quality issues, such as harmful algal blooms prohibiting safe water consumption in Lake Erie;
(4) economic sectors of the United States including agriculture, energy, consumer goods, and information technology report exposure to water risk, and these uses conflict with one another and with the demands for private and public drinking water supplies and ecosystem services;
(5) outside the United States, water challenges also threaten global health, security, and development, as 780,000,000 people worldwide lack access to clean water;
(6) considering the scale and severity of these challenges, there is a need for strategic research and development of new technologies, processes, and policies to address water quality, supply, distribution, treatment, reuse, conservation, and management; and
(7) a national strategy for water research, development, and deployment and efforts to facilitate public-private partnerships will help the United States effectively address high priority water challenges.
SEC. 3. DEFINITIONS.

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In this Act:
(1) Advisory committee.—The term "Advisory Committee" means the Water Resources, Quality, and Technology Advisory Committee established under section 5(d)(1).
(2) Assistant director.—The term "Assistant Director" means the Assistant Director for Water Resources, Quality, and Technology described in section 5(d)(1).
(3) Director.—The term "Director" means the Director of the National Science Foundation.
(4) Directorate.—The term "Directorate" means the Directorate for Water Resources, Quality, and Technology established under section 5(a).
(5) NSTC.—The term "NSTC" means the National Science and Technology Council.
(6) RD&D.—The term "RD&D" means research, development, and deployment.
(7) Water research center.—The term "water research center" means a water research center established under section 6(a).
SEC. 4. WATER RESEARCH REPORT.
Not later than 180 days after the date of enactment of this Act, the NSTC shall submit to Congress a report on the status of Federal efforts toward advancing water research, including—
(1) identification of existing programs and projects for each of the Federal agencies that carry out or support (including through grants, contracts, inter- and intra-agency transfers, and multiyear and no-year funds) basic and applied water RD&D activities; and
(2) a needs assessment for advancing research priorities of the United States related to water quality, supply, distribution, treatment, reuse, conservation, and management, including partnerships with private entities engaged in these areas of water research.
SEC. 5. FACILITATING PUBLIC-PRIVATE RESEARCH THROUGH ESTABLISHMENT OF THE DIRECTORATE FOR WATER RESOURCES, QUALITY, AND TECHNOLOGY.
(a) Establishment.—The Director shall establish within the National Science Foundation a Directorate for Water Resources, Quality, and Technology, to carry out the duties described in subsection (c).
(b) Purposes.—The purposes of the Directorate shall be—
(1) to advance the water research strategy of the United States as described in subsection (c);
(2) to facilitate public-private partnerships that increase leveraging and private cost-sharing on federally funded water research;
(3) to accelerate the deployment of water technologies that advance human health outcomes, water and energy efficiencies, water savings, and environmental protection; and
(4) to foster strategic collaboration between research conducted within Federal agencies and departments, researchers conducting federally funded research, institutions of higher education, industry, utilities, and nonprofit organizations.
(c) Duties.—
(1) In general.—The Directorate shall—

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(A) develop and, every 5 years, present to the NSTC, the Director of the Office of Management and Budget, and Congress a recommended long-term national water research strategy, which shall—
(i) be based on a regular review of water resources research supported by the Federal Government and other research organizations;
(ii) identify unmet and emerging water research challenges;
(iii) advise the Director of the Office of Management and Budget and Congress on the adequacy of mission-driven research budgets of Federal agencies relating to water; and
(iv) engage with States, industry, and other stakeholders to identify unmet and emerging water research challenges;
(B) promote the deployment of smart technologies that gathers, analyzes, and incorporates data from systems to improve the effectiveness and efficiency of civic operations and services and to ensure the resilience of civic systems against cybersecurity threats and physical and social vulnerabilities and breaches;
(C) establish an interdisciplinary funding pool focused on addressing water research priorities, particularly those that span the authorities of multiple Federal agencies and departments;
(D) through the new funding pool described in subparagraph (B), enter into non-Federal cost-sharing research grants, contracts, memoranda of understanding, or cooperative agreements with eligible entities to efficiently and effectively advance the goals and priorities of the Directorate;
(E) leverage existing Federal programs by encouraging joint solicitations, applications, and cost-share matching with non-Federal partners;
(F) coordinate with regional and the national water research centers;
(G) coordinate with national water research organizations; and
(H) carry out such other activities as the Assistant Director determines to be consistent with the purposes of the Directorate.
(2) Agreements.—
(A) In general.—Agreements entered into under paragraph (1)(C) shall be evaluated and awarded competitively through selection criteria developed by the Assistant Director.
(B) Eligible entities.—An eligible entity referred to in paragraph (1)(C) may include—
(i) an institution of higher education or a consortium of institutions of higher education;
(ii) [representatives of] industry;
(iii) industry associations;
(iv) national water research organizations;
(v) public and private utilities;
(vi) Federal research labs; and
(vii) public-private partnerships.

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(C) Results.—The Assistant Director shall develop criteria to determine whether the results of any RD&D activities carried out by the Directorate shall be made public, in consideration of intellectual property norms and publicly funded research requirements.
(3) Relationship to other activities.—The activities described in paragraph (1)—
(A) shall not supplement any other activities of the National Science Foundation; and
(B) shall not preempt any authority or responsibility of the National Science Foundation under another provision of law.
(d) Administration.—
(1) In general.—The Directorate shall be managed by an Assistant Director for Water Resources, Quality, and Technology.
(2) Advisory committee.—
(A) In general.—The Assistant Director shall manage the Directorate with the assistance of a Water Resources, Quality, and Technology Advisory Committee, which shall include the Director, acting in consultation with—
(i) the Secretary of Energy;
(ii) the Secretary of Agriculture;
(iii) the Secretary of Commerce;
(iv) the Secretary of the Interior;
(v) the Secretary of Defense; and
(vi) the Administrator of the Environmental Protection Agency.
(B) Bylaws.—The Assistant Director shall establish bylaws for the Advisory Committee that, at a minimum, include policies and terms for Advisory Committee membership, ethical standards, conflicts of interest, and sharing of intellectual property developed through activities of the Directorate.
(C) Membership.—
(i) In general.—The Assistant Director shall establish terms of membership, including setting procedures for appointment to the Advisory Committee, terms of member service, procedures to manage conflicts of interest, and all other such bylaws as are determined to be necessary by the Assistant Director.
(ii) Non-federal representatives.—The Assistant Director shall ensure that not less than \2/3\ of the members of the Advisory Committee are representatives of the non-Federal sector, including water and wastewater utilities.
(D) Chair.—The Assistant Director shall appoint a chair of the Advisory Committee, who shall serve at the pleasure of the Assistant Director.
SEC. 6. ESTABLISHMENT OF WATER RESEARCH CENTERS.
(a) Establishment.—
(1) In general.—The Assistant Director shall establish 6 public-private water research centers—

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(A) to be located at institutions of higher education or consortia or systems of institutions of higher education; and
(B) to serve as implementation partners for the Federal water research strategy and points of entry for private entities to engage with Federal water research and new partnerships.
(2) Geographic diversity.—There shall be one national center and 5 regional centers. Each regional water research center shall be located in a distinct region of the United States that differs in terms of—
(A) the water supply and demand challenges facing the public, agricultural and industrial sectors, and ecosystems; and
(B) the policy and legal frameworks impacting the region.(3) Focus.—Each water research center—
(A) shall focus primarily on the water priorities of the region, including the verification and testing of water and wastewater technologies at scale in which the water center is located, while providing collaboration, support, and expertise on water issues outside the region as may be necessary; and
(B) may partner with an entity or accept proposals from any region of the United States.
(C) the national research center will focus primarily on issues of importance to the entire water sector. It will commission original research, facilitate collaborations amongst regional centers and communicate research results to the end users.

(b) Duties.—Each water research center shall—
(1) identify needs, facilitating the provision of information to the Directorate through annual reports identifying regional challenges, research priorities, and RD&D findings;
(2) promote deployment of smart technologies that –
(i) gathers and incorporates data from systems, devices, and sensors embedded in civic systems and infrastructure to improve the effectiveness and efficiency of civic operations and services;
(ii) aggregates and analyzes gathered data;
(iii) communicates the analysis and data in a variety of formats;
(iv) makes corresponding improvements to civic systems and services based on gathered data; and
(v) Integrates measures to —
(vi) ensure the resilience of civic systems against cybersecurity threats and physical and social vulnerabilities and breaches;
(vii) protect the private data of residents; and
(viii) measure the impact of smart technologies on the effectiveness and efficiency of civic operations and services.

(3) serve as a point-of-entry and Federal liaison for businesses and researchers at institutions of higher education—

(A) to participate in Federal research relating to water; and

(B) to benefit from research developments, including through technology transfer, commercialization, participation in field testing, and incorporating research into best practices.

(c) Selection.—

(1) In general.—The Assistant Director shall select water research centers through a competitive process after careful review of all applications received and evaluation of criteria established by the Assistant Director under paragraph (2).

(2) Criteria.—The Assistant Director shall establish criteria for the evaluation of applications under this subsection with respect to the proposed water research center, including—

(A) the availability of appropriate research resources and technical expertise to meet objectives including research dissemination and stakeholder engagement;

(B) the strength of partnerships with regional industry, agriculture, and utilities facing water challenges, particularly small- and medium-sized entities that may face barriers to participating in or leveraging Federal RD&D funds due to limited resources;

(C) the presence of relevant regional technology clusters and private industry that demonstrate interest in partnering with the water research center; and

(D) successful and established engagement with relevant organizations focused on technology transfer, commercialization, or policy.

(d) Funding Priority.—The Assistant Director shall consider the RD&D findings described in subsection (b)(1) in setting RD&D research funding priorities and guidelines.

SEC. 7. FUNDING.

(A) Authorization of Appropriations.—There is authorized to be appropriated to the Director to carry out this Act [$50,000,000] for each of fiscal years 2017 through 2021.

(B) Allocation.— Of the amounts authorized to appropriated under subsection (a), [$30,000,000] shall be allocated for each fiscal year [equally] to the 6 water research centers.

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Exhibit 8

EXECUTIVE ORDER

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CODIFY EPA'S INTEGRATED PLANNING PROCESS AS AN OPTION FOR LOCAL GOVERNMENTS TO ADDRESS THEIR WASTEWATER AND STORM WATER MANAGEMENT NEEDS

Congressman Bob Gibbs introduced H.R. 6182, the Water Quality Improvement Act to amend the Federal Water Pollution Control Act to provide for an integrated planning and permitting process, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.
This Act may be cited as the ''Water Quality Improvement Act of 2016''.

SECTION 2. INTEGRATED PLANNING PROCESS.
Section 402 of the Federal Water Pollution Control Act (33 U.S.C. 1342) is amended by adding at the end the following:
''(s) INTEGRATED PLANNING AND PERMITTING.—
''(1) IN GENERAL.—The Administrator shall establish a comprehensive and flexible integrated planning process and permitting process for municipal wastewater and stormwater management that will help municipalities comply with the requirements of this Act by enabling municipalities to identify the most cost-effective and protective approaches to comply with such requirements, and prioritize their investments in addressing such requirements.
''(2) PLANNING AND PERMITTING PROCESS.—
The Administrator shall ensure that, under the planning and permitting process established under paragraph (1)—
"(A) actions taken by the municipality to comply with the requirements of this Act are implemented in a manner that—
''(i) considers alternative approaches and actions for the municipality to comply with such requirements;
''(ii) takes into consideration the technical feasibility and economic affordability of the alternative approaches and actions considered;
''(iii) accounts for the financial capability of the municipality to comply with such requirements;
''(iv) prioritizes such requirements in order to provide the greatest environmental and public health benefits for the resources expended;

"(v) accounts for both the municipality's preexisting and reasonably anticipated future compliance requirements related to, as applicable—

"(I) a combined sewer overflow;

"(II) a sanitary sewer overflow;

"(III) a capacity, management, operation, and maintenance program for sanitary sewer collection systems;

"(IV) a municipal stormwater discharge;

"(V) a municipal wastewater discharge;

"(VI) a water quality-based effluent limitation to implement an applicable wasteload allocation in a total maximum daily load;

"(VII) source water protection efforts that protect surface water supplies; and

"(VIII) nonpoint source controls through proposed trading approaches or other mechanisms;

"(vi) allows a municipality to develop a schedule of compliance that sequences the implementation of effluent limitations and other control measures based on the priorities established under clause (iv), in accordance with paragraph (4);

"(vii) enables the municipality to implement innovative or sustainable technologies, approaches, and practices to comply with such requirements, including through the use of green infrastructure measures as set forth in the memorandum issued by the Administrator on April 20, 2011, entitled 'Protecting Water Quality with Green Infrastructure in EPA Water Permitting and Enforcement Programs';

"(viii) provides for meeting the requirements of this Act by using the existing flexibilities in this Act and its implementing regulations, policies, and guidance; and

"(ix) reflects State requirements and planning efforts and incorporates State input on priority setting and other key implementation issues;

"(B) a municipality may develop an integrated plan, in consultation with the Administrator (or an authorized State, in the case of a permit program approved under subsection (b)), that—

"(i) identifies the compliance requirements of the municipality under this Act, including effluent limitations and other control measures to be implemented by the municipality;

"(ii) includes, as applicable, a schedule developed under subparagraph (A)(vi) for complying with such requirements; and

"(iii) includes documentation of the integrated planning and permitting process of the municipality under this section, including data and other information on which the integrated plan is based;

"(C) such an integrated plan (including as applicable, the schedule of compliance included in the plan) may be incorporated in whole or in part into a permit issued to the municipality under this section;

"(D) progress in implementing the integrated plan is tracked and evaluated;

''(E) a process for revising the integrated plan, using adaptive management processes, to account for adjustments and further actions that may be needed to comply with the requirements of this Act is incorporated into the integrated plan and the municipality's permit issued under this section;
''(F) with respect to any permit issued under this subsection that includes effluent limitations and other control measures that are established as part of a schedule of compliance included in such an integrated plan, such effluent limitations and other control measures included in that permit shall be based on water quality and other requirements under this Act that are technically feasible and economically affordable, as described in paragraphs (6) and (7); and
''(G) an authorized State, in the case of a permit program approved under subsection (b), may implement the integrated planning process under this subsection.
''(3) INTEGRATED PLANS.—
''(A) PLAN CONTENTS.—An integrated plan developed under this subsection shall include the elements described in Part III of the Integrated Municipal Stormwater and Wastewater Planning Approach Framework, issued by the Environmental Protection Agency and dated May 2012.
''(B) DISSEMINATION OF INFORMATION.—
The Administrator shall—
''(i) inform municipalities of the opportunity to develop an integrated plan; and ''(ii) at the request of a municipality or a State, provide information and technical assistance to the municipality or State regarding developing an integrated plan.
''(4) COMPLIANCE SCHEDULES.—
''(A) DURATION.—A schedule of compliance developed under paragraph (2)(A)(vi) and incorporated into a permit under this section may be implemented over more than 1 permit term.
"(B) SEQUENCING IMPLEMENTATION OF HIGH-PRIORITY CONTROL MEASURES.—A schedule of compliance under this subsection may allow a municipality to sequence the implementation of effluent limitations and other control measures that allow the municipality to implement, and assess the effectiveness of, the highest priority effluent limitations and other control measures before requiring implementation of other effluent limitations or control measures, if the schedule, once completed, would result in compliance with all requirements of this Act.
''(C) REASONABLE PROGRESS.—A schedule of compliance under this subsection shall provide for reasonable progress, including interim dates and milestones, as appropriate, to be made towards meeting the permit requirements subject to such schedule.
''(D) CONTROLS IDENTIFIED IN CURRENT AND SUBSEQUENT PERMITS.—Approved effluent limitations and other control measures to be implemented by the municipality pursuant to this subsection—
''(i) during the term of the current permit shall be identified as such in the schedule of compliance and the current permit, and shall be requirements of the current permit; and

''(ii) subsequent to the term of the current permit shall be identified as such in the schedule of compliance and the current permit, and shall become requirements of an appropriate subsequent permit, but shall not be requirements of the current permit.
''(E) STATE AUTHORITY TO AUTHORIZE SCHEDULES OF COMPLIANCE IN STATE WATER QUALITY STANDARDS.—
''(i) IN GENERAL.—Nothing in section 301(b)(1)(C) shall preclude a State from authorizing in its water quality standards the issuance of a schedule of compliance to meet water quality-based effluent limitations in permits that incorporate provisions of an integrated plan pursuant to this subsection.
''(ii) TRANSITION RULE.—In any case in which a discharge is subject to a judicial order or consent decree, as of the date of enactment of this subsection, resolving an enforcement action under this Act, any schedule of compliance issued pursuant to an authorization in a State water quality standard shall not revise or otherwise affect a schedule of compliance in that order or decree, unless the order or decree is modified by agreement of the parties and the court.
''(5) INTEGRATED PLAN AND PERMIT DECISIONMAKING.—
''(A) APPROVAL OF INTEGRATED PLANS AND PERMITS.—Integrated plans and permits incorporating such a plan developed under this subsection are subject to the approval of the Administrator (or an authorized State, in the case of a permit program approved under subsection (b)), which shall not be unreasonably withheld.
''(B) RENEWAL OF INTEGRATED PERMIT.—
''(i) IN GENERAL.—At the time of renewal of a municipality's integrated permit issued pursuant to this subsection, the Administrator (or an authorized State, in the case of a permit program approved under subsection (b)) shall review the schedule of compliance and other requirements included in the existing permit to determine whether the requirements should be continued or modified.
''(ii) REVIEW CONSIDERATIONS.—The permit review shall assess whether changed circumstances warrant adjusting the actions to be taken by the municipality, including whether—
''(I) the effluent limitations and other control measures in the current permit are expected to result in the municipality complying with the requirements of this Act within the timeframes provided in the schedule of compliance;
''(II) the effluent limitations and other control measures continue to be technically feasible and economically affordable under paragraphs (6) and (7);
''(III) new innovative treatment approaches are available that provide greater environmental and public health benefits or have fewer adverse environmental impacts for the resources expended;
''(IV) the municipality is subject to additional regulatory requirements;
''(V) the municipality's financial capability has changed; and

''(VI) reasonable progress has been achieved, as provided for under paragraph (4)(C), including meeting interim dates and milestones, and if not, the reasons for such failure to achieve reasonable progress.
''(iii) CONTINUATION OF REQUIREMENTS IN RENEWED PERMIT.—The permit requirements in an existing permit shall be incorporated into the renewed permit, unless the Administrator (or the authorized State, in the case of a permit program approved under subsection (b)) determines that a requirement should be modified or removed to help the municipality comply with the requirements of this Act through the implementation of technically feasible and economically affordable effluent limitations and other control measures.
''(C) TRANSPARENCY OF PERMIT DECISIONS.—Prior to approving a plan developed under this subsection and issuing or renewing a permit incorporating such a plan pursuant to this subsection, or denying a request from a municipality for approval of a plan and issuance or renewal of a permit incorporating such a plan under this subsection, the Administrator (or an authorized State, in the case of a permit program approved under subsection (b)) shall—
''(i) prepare a report explaining the rationale for the proposed decision; and
''(ii) make the report publicly available for review and comment by the municipality and other interested parties.
"(D) ADMINISTRATOR REVIEW OF STATE PERMITTING DECISIONS.—When the Administrator provides his or her views to a State concerning a proposed integrated plan or permit incorporating such a plan that is to be issued by the State pursuant to this subsection, the Administrator shall make those views available in a written document that is publicly available for review and comment by the municipality and other interested parties.
''(6) TECHNICAL FEASIBILITY CRITERIA.—In making a determination of technical feasibility under this subsection, the Administrator (or the State) shall consider—
''(A) naturally occurring pollutant concentrations;
''(B) natural, ephemeral, intermittent, or low flow conditions or water levels;
''(C) human-caused conditions or sources of pollution that cannot be remedied or would cause more environmental damage to correct than to leave in place;
''(D) dams, diversions, or other types of hydrologic modifications that make it not feasible to restore the water body to its original condition or to operate such modification in a way that would comply with the requirements of this Act; and
''(E) physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, that may preclude compliance with the requirements of this Act.
''(7) ECONOMIC AFFORDABILITY CRITERIA.—
''(A) IN GENERAL.—In making a determination of economic affordability under this subsection, the Administrator (or the authorized State, in the case of a permit program approved under subsection (b)) shall consider preexisting and potential future costs, including of debt service, to

the municipality for implementing effluent limitations and other control measures necessary to comply with the requirements of this Act would result in substantial and widespread economic and social impact in the service area of the municipality.
"(B) BASIS FOR DETERMINING IMPACTS.— In determining whether the economic and social impacts of preexisting and potential future costs under subparagraph (A) are substantial and widespread, the Administrator (or the State) shall consider the financial condition both of the municipality and of persons in the service area of the municipality, taking into consideration factors including—
"(i) socioeconomic indicators, including income and unemployment data for the service area of the municipality;
"(ii) population trends in the service area of the municipality;
"(iii) impacts on low-income households in the service area, including the ability of such households to pay basic shelter costs;
"(iv) whether there is a local industry that is failing or relocating out of the service area of the municipality, or if a local industry might fail or relocate if higher taxes or fees are imposed on it;
"(v) the municipality's capital improvement plan and whether the municipality would, in order to finance improvements to comply with the requirements of this Act, have to divert resources that would otherwise be used for investment in essential capital projects that provide core public services to the community;
"(vi) the ability of the municipality to incur more debt, including its ability to issue, and find a market for, additional municipal bonds;
"(vii) whether the debt incurred to implement the effluent limitations and other control measures has or will result in a lowering of the municipality's bond rating;
"(viii) whether the municipality has limited legal authority to pass increased costs through to ratepayers and increased costs of water quality programs must be paid from its general fund;
"(ix) the legally adopted rate structure for provision of water- and wastewater-related services in the service area in effect at the time that a determination of economic affordability is made;
"(x) the cumulative costs paid by persons in the service area to an entity for provision of water- and wastewater-related services; and
"(xi) other information determined to be relevant by the Administrator (or the authorized State, in the case of a permit program approved under subsection (b)), including whether the municipality is located in an area eligible for assistance under section 201 or 209 of the Public Works and Development Act of 1965 (42 U.S.C. 3141, 3149), as described in section 301 of that Act (42 U.S.C. 3161).
"(C) CUMULATIVE COSTS FOR WATER AND WASTEWATER-RELATED SERVICES.—
"(i) INCLUSIONS.—Cumulative costs for the provision of water- and wastewater related services to be considered under subparagraph (B)(xi) shall include the municipality's preexisting and

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reasonably anticipated future costs paid by a person, including through taxes and fees, for the municipality's cost of—

''(I) compliance with federal and state water- and wastewater-related and other regulatory requirements;

''(II) operation and maintenance of water and wastewater systems;

''(III) asset management; and

''(IV) servicing any debt incurred or to be incurred to finance the other costs referred to in this clause.

''(ii) SUBSTANTIAL IMPACT.—In making a determination of economic impact under subparagraph (B), the Administrator (or the State) shall consider the impact on a person to be substantial if the cumulative costs paid by the person exceeds, or is projected to exceed, 2 percent of the person's annual household income.

''(iii) WIDESPREAD IMPACT.—In making a determination of economic impact under subparagraph (B), the Administrator (or the State) shall consider the impact to be widespread if percent or more of persons in the service area of the municipality face a substantial impact described in clause (ii).

''(D) ADDITIONAL REQUIREMENTS.—In making a determination of economic affordability under this subsection, the Administrator (or the State) shall not base the determination on—

''(i) median household income in the service area of the municipality; or

''(ii) an expected minimum level of expenditure on the provision of water and wastewater services by a municipality.

''(8) FLEXIBILITY.—

''(A) IN GENERAL.—Nothing in this subsection reduces or eliminates any flexibility available under this Act, including the authority of a State to—

''(i) revise a water quality standard after a use attainability analysis under section 131.10(g) of title 40, Code of Federal Regulations (as in effect on the date of enactment of this subsection); or

''(ii) adopt a water quality standards variance under section 131.14 of title 40, Code of Federal Regulations (as in effect on the date of enactment of this subsection).

''(B) APPROVALS.—Such a revision of a standard or adoption of a variance by a State under subparagraph (A)(i) is subject to the approval of the Administrator under section 303(c), which shall not be unreasonably withheld.''.

SEC. 3. UPDATING FINANCIAL CAPABILITY ASSESSMENT GUIDANCE.

(a) IN GENERAL.—

(1) UPDATE.—Not later than 15 months after the date of enactment of this Act, the Administrator shall update the financial capability assessment guidance published by the Administrator entitled ''Combined Sewer Overflows—Guidance for Financial Capability Assessment and Schedule Development'' (EPA 832–B–97–004), dated February 1997.

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(2) SCOPE.—In updating the financial capability assessment guidance developed under subparagraph (1), the Administrator shall ensure that the guidance may be used for assessing the financial capability of municipalities to implement effluent limitations and other control measures under the Federal Water Pollution Control Act.
(b) REQUIREMENTS FOR UPDATING.—In updating the financial capability assessment guidance under subsection (a), the Administrator shall—
(1) consult with, and solicit advice and recommendations from, representative municipal and State officials (including their representative regional or national organizations), stakeholders, and other interested parties regarding how to assess the financial capability of municipalities to implement effluent limitations and other control measures under the Federal Water Pollution Control Act;
(2) ensure transparency in the consultation process, including promptly making accessible to the public all communications, records, and other documents of all meetings that are part of the consultation process;
(3) ensure that the updated guidance takes into consideration relevant studies, reports, and other information related to assessing the financial capability of municipalities to implement effluent limitations and other control measures, including—
(A) the reports of recommendations to the Environmental Protection Agency from the Environmental Financial Advisory Board related to financial capability assessments of municipalities; and
B) the memorandum of the Environmental Protection Agency entitled ''Financial Capability Assessment Framework for Municipal Clean Water Act Requirements'', dated November 24, 2014, and the accompanying guidance entitled ''Financial Capability Assessment Framework'', dated November 24, 2014;
(4) ensure the evaluations by the Administrator of financial capability assessment and schedule of compliance development under subsection (s) of section 402 of the Federal Water Pollution Control Act reflect the economic affordability criteria described in subsection (s)(7) of that section;
(5) ensure the updated guidance provides a consistent reference point to aid parties in negotiating reasonable and effective schedules for implementing effluent limitations and other control measures under the Federal Water Pollution Control Act;
(6) publish in the Federal Register proposed updated financial capability assessment guidance under this section, and provide a period for public comment of not less than 60 days;
(7) prepare final updated financial capability assessment guidance, taking into account—
(A) the advice and recommendations obtained from the municipal and State officials (including their representative regional or national organizations), stakeholders, and other interested parties; and
(B) the public comments received during the public comment period; and

(8) publish in the Federal Register, and submit to the Committee on Transportation and Infrastructure of the House of Representatives and the Committee on Environment and Public Works of the Senate, the final updated financial capability assessment guidance.

SEC. 4. INTEGRATED PERMIT PILOT PROJECTS.

(a) IN GENERAL.—In the first 5 fiscal years beginning after the date of enactment of this Act, the Administrator, in coordination with appropriate State, local, and regional authorities, shall work cooperatively with, and facilitate the efforts of, not fewer than 15 municipalities to develop and implement integrated plans and permits to meet the requirements of the Federal Water Pollution Control Act (33 U.S.C. 1342) in a manner consistent with section 402(s) of that Act.

(b) SELECTION OF MUNICIPALITIES.—

(1) ELIGIBILITY OF MUNICIPALITIES.—A municipality shall be eligible to participate in the pilot program under subsection (a) if the municipality—

(A) has a permit issued under section 402 of the Federal Water Pollution Control Act; or

(B) is operating under an administrative order, administrative consent agreement, or judicial consent decree to comply with the requirements of that Act.

(2) FACTORS.—In selecting municipalities eligible under paragraph (1), the Administrator shall—

(A) give priority to municipalities—

(i) that are operating under an administrative order, administrative consent agreement, or judicial consent decree to comply with the requirements of the Federal Water Pollution Control Act;

(ii) having difficulties complying with the Federal Water Pollution Control Act, in addition to the municipalities described in clause (i); or

(iii) that are affected by affordability constraints in planning and implementing effluent limitations and other control measures under the Federal Water Pollution Control Act to address wet weather discharges or other water pollution issues from their wastewater and stormwater facilities;

(B) give further priority to those municipalities under subparagraph (A)—

(i) with knowledge and experience in developing integrated and adaptive clean water management practices, without regard to the status of the municipality in the process of planning or implementing such practices; and

(ii) that are seeking to develop and implement an integrated plan that includes adaptive approaches to account for changed or future uncertain circumstances; and

(C) seek to select municipalities—

(i) from different geographical regions of the United States; and

(ii) of various population sizes.

(3) ADDITIONAL AUTHORITY.—In carrying out this section, the Administrator may, with the agreement of and in coordination with a municipality and the applicable State—

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(A) modify the implementation terms of an existing administrative order or administrative consent agreement, or seek to modify a judicial consent decree entered into by the municipality with the Administrator pursuant to the Federal Water Pollution Control Act; and
(B) incorporate such modified implementation terms, including the municipality's integrated plan, into an integrated permit issued pursuant to section 402(s) of the Federal Water Pollution Control Act.
(c) REPORT TO CONGRESS.—Not later than 1 year after the date of enactment of this Act, and each year thereafter for 5 years, the Administrator shall prepare and submit to the Committee on Transportation and Infrastructure of the House of Representatives and the Committee on Environment and Public Works of the Senate a report on the implementation of this section and issuance of integrated permits pursuant to section 402(s) of the Federal Water Pollution Control Act, including—
(1) identification of the municipalities selected under this section;
(2) an evaluation of the specific outcomes achieved with respect to—
(A) reducing the costs of complying with the requirements of the Federal Water Pollution Control Act for the municipalities selected under this section; and
(B) making reasonable progress towards achieving the applicable water quality and human health objectives of the Federal Water Pollution Control Act; and
(3) recommendations of any proposed legislative or administrative changes to improve the effectiveness and efficiency of the integrated planning and permitting process under section 402(s) of the Federal Water Pollution Control Act.

SEC. 5. DEFINITIONS.

In this Act:
(1) MUNICIPALITY.—The term ''municipality'' has the meaning given that term in section 502(4) of the Federal Water Pollution Control Act (33
15 U.S.C. 1362(4)).
(2) ADMINISTRATOR.—The term ''Administrator'' means the Administrator of the Environmental Protection Agency.

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Exhibit 9

EXECUTIVE ORDER/POLICY MEMORANDUM

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DRAFT LANGUAGE FOR CONSISTENT APPLICATION OF PROJECT SELECTION CRITERIA

[White House Letterhead]
January 20, 2017

MEMORANDUM FOR
THE ADMINISTRATOR OF THE ENVIRONMENTAL PROTECTION AGENCY
THE SECRETARY OF THE ARMY
THE SECRETARY OF AGRICULTURE
THE SECRETARY OF HOUSING AND URBAN DEVELOPMENT
THE SECRETARY OF INTERIOR
THE SECRETARY OF COMMERCE
THE ADMINISTRATOR OF GENERAL SERVICES ADMINISTRATION
THE COMMANDING GENERAL, US ARMY CORPS OF ENGINEERS

Subject: Rebuilding the Nation's Failing Water Infrastructure
As I have emphasized previously, rebuilding our Nation's water and wastewater infrastructure (collectively referred to herein as "water" or "water infrastructure") will be among my Administration's top domestic priorities. Providing safe, clean, and dependable sources of water is fundamental to protecting public health and the environment in addition to creating jobs and supporting local economies.

The Nation's water infrastructure has fallen into grave disrepair and government at all levels must resolve to improve systems and work collaboratively, maximizing private sector participation, to address this serious and growing problem. Federal mandates, combined with local economic conditions, have exacerbated the ability of local governments to access affordable public financing needed to upgrade and maintain their water infrastructure. Reforms in agency planning and financing of water infrastructure are essential to achieve economic efficiency and sustainability.

Subtitle C of Title V of the Water Resources Reform and Development Act of 2014 established the Water Infrastructure Finance and Innovation Act (WIFIA), a program designed to assist a wide array of water infrastructure projects intended to attract private capital, along with state and local public capital, alongside federal investment. WIFIA, and its implementing regulations, sets forth important principles and criteria to improve structured financing and improving the financial, technical and operational capacity of local water systems.

Section 1. Effective Federal Assistance
Federal agencies providing financial assistance for drinking water and wastewater infrastructure serve an important role in promoting sustainable water systems and local capacity building.
I am therefore directing you to review those programs of your agency that provide loans and grants for water infrastructure, and modify those programs to

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(a) eliminate bureaucratic red tape and delays in funding high priority projects, including those within disadvantaged communities;

(b) encourage new approaches, including leveraging the use of market-based elements and partnerships; and

(c) adopt eligibility criteria, modeled after Section 3907(b) (2) of the Water Infrastructure Finance and Innovation Act of 2014 (WIFIA) and EPA's proposed interim final rule implementing the new WIFIA program, to promote the use of innovative technology, energy-savings, water and resource conservation, and resilient and sustainable systems and materials.

Section 2. Ecosystem Services
I am directing the Administrator of the Environmental Protection Agency to establish an office of Ecosystem Services, which shall promote market-based approaches to cost-effectively achieve compliance with federal environmental requirements, and coordinate with other Federal agencies to advance such markets.

Section 3. Interagency Coordination
I am assigning lead responsibility to organize and coordinate this initiative to the Presidential Commission on Water Infrastructure Policy Coordination and Security (the "Water Commission) established by Executive Order _____. A final report by each agency on proposed program modifications shall be submitted by July 25, 2017 to the Water Commission, with assistance of the Environmental Protection Agency and the Office of Management and Budget, shall ensure implementation of this directive.

[President's Signature]

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To: Dravis, Samantha[dravis.samantha@epa.gov]
Cc: Chai, Amy[achai@nahb.org]
From: Spielvogel, Tamra
Sent: Mon 4/3/2017 5:29:01 PM
Subject: NAHB Follow-up Information on RRP Program
9-7-2016 NAHB RRP Section 610 Comments.pdf
NAHB Comment Letter 7-6-15 Test Kits Public Meeting Docket .pdf
NAHB Comments LeadTestKit 2-19-2016.pdf
NAHB Petition for Reconsideration 7-5-2016.pdf
RRP Test Kit Petition 09.29.10.pdf
Petition Response NAHB signed 12-8-16.pdf

Dear Ms. Dravis,

I'm emailing in follow-up to your conversation with Michael Mittelholzer at the NAHB meeting with Administrator Pruitt last week. I know several issues were discussed for additional follow-up during the meeting with the Administrator including the Renovation, Repair and Painting (RRP) Program and stormwater issues which my colleague Eva will be following up with you on in a subsequent message.

Attached is the material you and Michael discussed to provide additional detail regarding NAHB's concerns regarding implementation and evaluation of the RRP program. Specifically I have provided copies of NAHB's comments related to the Section 610 review as well as those NAHB submitted during both public comment periods EPA opened during the review of issues related to the lack of an approved lead test kit. Also, for your information I am including copies of two petitions NAHB has filed with EPA on the RRP program. The most recent was in regards to the changes made to the refresher training course requirements which was denied by the agency in December 2016. The EPA response is also enclosed. I have enclosed the 2010 petition because while the other documents discuss the issues we have with the economic analysis of the rule, it was most comprehensively addressed in this petition on the test kit.

Finally, I was also told you are interested in the report where EPA's cost benefit estimates were called into question. The report was issued by the EPA Office of the Inspector General. The following link will take you to the OIG page for the report where you can access their findings, the report, as well as the responses exchanged between OIG and EPA on the report.

•□□□□□□□□ https://www.epa.gov/office-inspector-general/report-review-hotline-complaint-concerning-cost-and-benefit-estimates-epas

I would note that one of the commitments made by the EPA to the OIG was to collect better data but they made the commitment to do so in the context of a separate rulemaking (the development of an RRP rule for Public & Commercial Buildings) and that survey is currently underway. NAHB individually and as part of an industry coalition has called into question the efficacy of this effort. While the data may be useful to the residential program collecting it in the context of the Public & Commercial Buildings rule has never seemed appropriate or truly illustrative given a range of other differences between the two rules. Furthermore, the data is being collected prior to establishing a hazard for Public & Commercial Buildings.

NAHB looks forward to continuing the dialogue with EPA on this program and we would appreciate the opportunity to set up a meeting with you and your team to discuss these issues further. Please feel free to contact me at 202-266-8327 or tspielvogel@nahb.org.

Regards,

Tamra Spielvogel

TAMRA SPIELVOGEL Program Manager, Environmental Policy
National Association of Home Builders
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We Build Communities

April is New Homes Month – celebrate with your favorite home buyer!

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National Association of Home Builders

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September 7, 2016

Michelle Price and Jonathan Shafer
U.S. Environmental Protection Agency
Office of Chemical Safety and Pollution Prevention,
1200 Pennsylvania Ave. N.W. (7404T)
Washington, DC 20460

(Submitted electronically via website *www.regulations.gov*)

RE: Comments on Section 610 Review of Lead-Based Paint Activities; Training and Certification for Renovation and Remodeling Section 402(C)(3) (EPA-HQ-OPPT-2016-0126-0001)

Dear Ms. Price and Mr. Shafer,

On June 9, 2016, the U.S. Environmental Protection Agency (EPA) announced [1] that it was initiating a review of the 2008 "Lead; Renovation, Repair, and Painting Program" (RRP) rule [2] under Section 610 of the Regulatory Flexibility Act.[3] EPA also stated that it will consider relevant comments on the RRP rule's 2010 [4] and 2011[5] amendments, as well as on lead test kits, field testing alternatives, and other broader concerns referenced in prior lead test kit RRP rulemakings.[6]

The Natio nal Association of Home Builders (NAHB) appreciates the opportunity to provide comments on this Section 610 review of the RRP rule. NAHB is a federation of more than 700 state and local home builder associations nationwide. The organization's membership includes over 140,000 firms engaged in land development, single and multifamily residential construction, remodeling, multifamily ownership and management, building material trades, building products manufacturing and supply, and commercial and light indus trial construction projects. Over 95

[1] 81 Fed. Reg. 37,373 (June 9, 2016).

[2] 73 Fed. Reg. 21,692 (Apr. 22, 2008).

[3] 5 U.S.C. § 610.

[4] EPA, *Lead; Amendment to the Opt -Out and Recordkeeping Provisions in the Renovation, Repair, and Painting Program*, 75 Fed. Reg. 24,802 (May 6, 2010).

[5] EPA, *Lead; Clearance and Clearance Testing Requirements for the Renovation, Repair, and Painting Program*, 76 Fed. Reg. 47,917 (Aug. 5, 2011).

[6] *See* EPA, *Lead; Renovation, Repair and Painting Program; Lead Test Kit Stakeholder Meeting; Notice of Public Meeting*, 80 Fed. Reg. 27,621 (May 14, 2015); EPA, *Lead; Renovation, Repair and Painting Program; Lead Test Kit; Notice of Opening of Comment Period*, 80 Fed. Reg. 79,335 (Dec. 21, 2015).

percent of NAHB's members are classified as "small businesses," as defined by the U.S. Small Business Administration (SBA). NAHB members collectively employ over 3.4 million people nationwide. Four out of every five new homes are built by NAHB members.

NAHB has a profound interest in ensuring that EPA performs a robust Section 610 review of the RRP rule. NAHB has been actively engaged in EPA's lead-based paint program for the residential sector since its inception and has been an advocate and supporter of the required training completion for its members. The RRP program impacts NAHB members in the field during the daily practice of their jobs. Throughout the program's development and implementation, NAHB has facilitated stakeholder engagement and provided ongoing input to EPA. The comments included in this letter are intended to supplement and expand upon comments made by NAHB in prior stakeholder meetings, comment letters, and administrative and judicial filings concerning the RRP program.

NAHB believes the RRP program, as it is currently being implemented, is an inefficient tool for achieving the environmental and health goals of the underlying statute and rule. Most importantly, the lack of a reliable, commercially available lead paint test kit means renovators must continue to apply lead-safe work practices in places where no lead-based paint hazard exists—making the program *more expansive and expensive* than EPA projected. Other aspects of the program, including the new renovator recertification requirements, add needless complexity to the rule's implementation and create an unnecessary bias against online training. NAHB urges EPA to use the Section 610 review process as an opportunity to revisit the rule's underlying cost assumptions and revise certain program design choices. This will ensure a better, more efficient program going forward.

OVERVIEW AND BACKGROUND

2008 Rule. On April 22, 2008, EPA published the final RRP rule "to address lead-based paint hazards created by renovation, repair, and painting activities that disturb lead-based paint in target housing and child-occupied facilities" built before 1978.[7] Among other provisions, the rule requires contractors to use lead-safe work practices during renovation, repair, and painting activities that disturb lead-based paint in buildings covered by the program, *unless* a determination can be made that the building does not contain federally-regulated levels of lead-based paint.[8] To make this determination, a certified renovator could use an EPA-recognized lead paint test kit, if one were available. A qualifying test kit must meet two separate regulatory

[7] 73 Fed. Reg. at 21,692. "Target housing" is any housing constructed before 1978, with certain exceptions for housing for the elderly or disabled or any zero-bedroom dwelling.

[8] The standard is set at content levels that equal or exceed 1.0 milligrams per square centimeter (mg/cm^2) or 0.5 percent by weight. *See* 40 CFR § 745.82(a).

criteria: a negative -response criterion and a positive -response criterion.[9] At the time EPA finalized the 2008 rule, no available test kit met *both* of these criteria. But EPA felt "confident that improved test kits meeting both of EPA's benchmarks [would] be commercially available by September 2010."[10] In EPA's economic analysis for the rule, the agency assumed a qualifying test kit would become available in mid -2011.[11] Absent a recognized test kit, renovators had to assume that lead paint is present and, hence, apply lead-safe work practices.

2010 Amendment. In 2010, EPA amended the RRP rule to remove the "opt -out" provision that exempted renovators from the program's requirements if the homeowner certified that no children under age six or pregnant women were present in the home and the home was not a child-occupied facility. According to EPA's economic analysis for the 2010 amendment, eliminating the opt -out provision increased the number of pre -1978 homes affected by the program by approximately 40.2 million, effectively doubling the scope of the program.[12] The amendment made no change to the test kit requirements, or to EPA's assumptions about the availability of a test kit meeting both of the regulatory criteria. At the time, EPA "expect[ed] test kits that more accurately determine whether a painted surface qualifies as lead-based paint [would] become available in late 2010."[13] The economic analysis again assumed a qualifying test kit would become available in mid-2011.[14]

2011 Amendment. In 2011, EPA amended the RRP rule to include, among other revisions, a provision allowing a certified renovator to use paint chip analysis (i.e., collecting a paint chip sample and sending it to a recognized laboratory for analysis) in lieu of a test kit.[15] As discussed below, the 2011 amendment has not provided renovators with any *practical* alternative to using

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[9] *See* 40 CFR § 745.88(c). These criteria relate to the probability of receiving false negative results and false positive results, respectively, when using the test kit.

[10] 73 Fed. Reg. at 21,712.

[11] *See* EPA, Office of Pollution Prevention and Toxics (OPPT) *Economic Analysis for the TSCA Lead Renovation, Repair, and Painting Program Final Rule for Target Housing and Child-Occupied Facilities* (March 2008) (2008 Rule Economic Analysis) at 4 ("EPA expects that improved test kits . . . will be commercially available by September 2010, but this analysis does not assume that the improved test kits will be in use until *the second year that all of the rule's requirements are in effect.*") (emphasis added).

[12] *See* EPA, Economic and Policy Analysis Branch Economics, Exposure and Technology Division OPPPT, *Economic Analysis for the TSCA Lead Renovation, Repair, and Painting Program Opt -out and Recordkeeping Final Rule for Target Housing and Child Occupied Facilities* (April 2010) (2010 Amendment Economic Analysis) at ES 1 -2 ("There are 78 million target housing units and [child occupied facilities] . . . The 2008 [RRP] rule applied to 37.7 million target housing units and 0.1 million public and commercial buildings. About 40.2 million target housing units would be added to the regulated universe due to the elimination of the opt-out provision.")

[13] 75 Fed. Reg. at 24,811.

[14] 2010 Amendment Economic Analysis at ES4 ("[T]his analysis assumes that improved test kits will be in use starting in June 2011.").

[15] 76 Fed. Reg. at 47,918.

a test kit. (Indeed, the paint chip testing method existed at the time EPA was developing the 2008 rule. At that time, EPA evaluated and dismissed the method as infeasible and too expensive.)

2015 Congressional Directive. By 2015, no qualifying test kit had emerged. In response, Congress issued a directive in EPA's Fiscal Year 2015 Appropriations Act policy rider for EPA to "prioritize efforts with stakeholders in fiscal year 2015 to identify solutions that would allow for a test kit to meet the criteria within the 2008 rule to reduce costs for consumers, remodelers and families to comply with the rule."[16] Congress further ordered that "[i]f no solution is reached by the end of the fiscal year, EPA should revisit the test kit criteria in the 2008 rule and solicit public comment on alternatives."[17] In the summer of 2015, EPA held a stakeholder meeting on test kit issues, including the existing market for test kits and alternatives to lead -based paint field testing.[18] In late 2015, EPA o pened a new comment period on test kits and other field testing options, "as suggested" by the congressional policy rider. [19] This comment period closed in February 2016, and any resolution on these issues is outstanding.

As of this date —nearly five years a fter EPA initially assumed an approved test kit would be available—no such kit exists to help minimize the costs and other burdens of the RRP program on NAHB's members and homeowners.

SECTION 610 COMMENTS

EPA seeks comment on the following statutory factors:

(1) the continued need for the rule;

(2) the nature of complaints or comments received concerning the rule;

(3) the complexity of the rule;

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[16] FY 2015 Consolidated and Further Continuing Appropriations Act. *See* Joint Explanatory Statement in the Congressional Record for P.L. No: 113-235.

[17] *Id.*

[18] *See* 80 Fed. Reg. at 27,623.

[19] 80 Fed. Reg. at 79,335. "Without proposing any regulatory amendments," EPA sought comment on a range of potential lead test kit and field testing options, including: proposing to eliminate the positive response criter ion; proposing to modify the positive response criterion; maintaining the current negative response and positive response criteria; proposing to provide reduced RRP certification training requirements for X-Ray fluorescence (XRF) technicians; and exploring any other lead-based paint field testing technology that would provide reduced costs for consumers, remodelers and families to comply with the RRP rule. *Id.* at 79,336.

(4) the extent to which the rule overlaps, duplicates, or conflicts with other Federal, State, or local government rules; and

(5) the degree to which the technology, economic conditions or other factors have changed in the area affected by the rule.[20]

As discussed below, NAHB is constrained in its ability to provide meaningful comment on all of these factors due to the way EPA has structured its Section 610 review. Nevertheless, NAHB offers the following comments.

1. **EPA Must Perform a New Economic Analysis Because No Qualifying Lead Test Kit Has Entered the Market (Factor 5)**

EPA must revise the RRP rule's economic analysis. This analysis was required as part of the process of adopting the RRP in 2008 and was updated to reflect subsequent amendments that placed greater burdens on NAHB members and other members of the regulated community. However, a central premise of the economic analysis, even in its revised form, has continued to be that an approved test kit would be available. Because the linchpin test kit still does not exist, the economic analysis must be updated.

EPA's obligation to realistically assesses the potential impacts of the RRP rule on the regulated community has several sources. First, Toxic Substances Control Act (TSCA) Section 2(c) directs EPA to consider the environmental, economic, and social impacts of new rules.[21] Second, Executive Order (E.O.) 12866 directs agencies to "assess all costs and benefits of available regulatory alternatives [to a proposed regulation], including the alternative of not regulating" and to "select those approaches that maximize net benefits."[22] Finally, the Regulatory Flexibility Act, as amended by the Small Business Regulatory Enforcement Fairness Act, requires agencies to consider the impacts of regulations on small businesses, including "any significant alternatives . . . which accomplish the stated objectives of applicable statutes and which minimize any significant economic impact . . . on small entities[.]"[23] Congress intended the Regulatory Flexibility Act "to encourage federal agencies to utilize innovative administrative procedures in dealing with individuals, small businesses, [and other small entities] that would otherwise be unnecessarily adversely affected by federal regulations . . . [and] to better enable [agencies] to

[20] *See* 5 U.S.C. § 610(b).

[21] *See* 73 Fed. Reg. at 21,701.

[22] William Clinton, *Regulatory Planning and Review*, 58 Fed. Reg. 51,735 (Sept. 30, 1993).

[23] 5 U.S.C. § 603(c); *see also Int'l Internship Programs v. Napolitano*, 853 F. Supp. 2d 86, n.12 (D.D.C. 2012), *aff'd sub nom. Int'l Internship Program v. Napolitano*, 718 F.3d 986 (D.C. Cir. 2013) (noting that the Regulatory Flexibility Act "is concerned with a regulation's economic impact on a *substantial number* of small entities") (emphasis in original) (internal citation omitted).

tailor regulations to the size and resources of those who will be affected by them."[24] EPA can only fulfill the intent of Congress by accurately assessing the impacts of its rules on small businesses.

Moreover, Section 610 itself requires agencies to minimize the significant economic impacts of a rule on small entitie s as part of its periodic review.[25] Thus, Section 610 imposes a continuing obligation on EPA to minimize the impacts of the RRP rule on NAHB members and other members of the regulated community, consistent with the stated objective of the Residential Lead -Based Paint Hazard Reduction Act.[26] EPA can hardly discharge this duty without having an accurate understanding of what those impacts are.

EPA's economic analysis for the RRP rule has been flawed since the beginning. A 2012 Office of Inspector General (OIG) report faulted EPA for relying on "limited data" in developing cost and benefit estimates for the rule's underlying economic analyses.[27] One of EPA's key assumptions was that a qualifying test kit would enter the market. Because this never happened, EP A's analysis remains fundamentally flawed. This undermines the entire basis for the initial RRP rulemaking and subsequent amendments. EPA must go back and re -perform the economic analysis for the rule, now that the original analysis is known to be inaccurate.

As described above, EPA assumed that a qualifying test kit would be available by 2011.[28] EPA predicted this would reduce the number of RRP renovation events by almost half, from 8.4 million in the first year to 4.4 million in the second year.[29] As EPA recognized, "[b]ecause not all buildings

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[24] S. Rep. No. 96-878, 96th Cong., 2d Sess. (July 30, 1980).

[25] *See Warshauer v. Chao*, 2008 WL 2622799, at *33 (N.D. Ga. May 7, 2008), *aff'd sub nom. Warshauer v. Solis*, 577 F.3d 1330 (11th Cir. 2009) ("Under [Section 610], an agency must review its rules periodically to determine the effect of such rules on small entities and the need for such rules."); *In re Stock Exchanges Options Trading Antitrust Litig.*, 2001 WL 128325, at *n.4 (S.D.N.Y. Feb. 15, 2001), *aff'd*, 317 F.3d 134 (2d Cir. 2003) (An agency "is required to review those rules which have a significant economic impact upon a substantial number of small entities, in order to determine whether such rules should be continued without change, or should be amended or rescinded.") (internal citation omitted).

[26] 42 U.S.C. § 4851.

[27] The report further recommended that EPA re-examine those costs and benefits to determine whether the rule should be modified, streamlined, expanded, or repealed. *See* OIG, *Review of Hotline Complaint Concerning EPA's Lead-Based Paint Rule* (July 25, 2012). While EPA committed to gather addition al information on costs from the regulated community in *future* RRP rulemakings, including the public and commercial buildings rule, EPA declined to re-visit its economic analysis for the 2008 rule. *See* EPA, Office of Chemical Safety and Pollution Preventin, *Response to OIG Final Report on Hotline Complaint Concerning EPA's Lead Based Paint Rule, Report No. 12 -P-0600* (Oct. 22, 2012); EPA, Office of Chemical Safety and Pollution Prevention, *Response to Office of Inspector General Final Report No. 12-P-0600 "Review of Hotline Complaint Concerning EPA's Lead-Based Paint Rule, dated July 25, 2012* (Nov. 28, 2012).

[28] 2008 Rule Economic Analysis at 4; 2010 Amendment Economic Analysis at ES-4.

[29] 2008 Rule Economic Analysis at 4; 2010 Amendment Economic Analysis at ES-4 (Table ES-3).

built before 1978 have lead-based paint, the number of renovation events that need to use lead safe work practices (LSWP) is a subset of the total number of events covered by the rule."[30] EPA projected a corresponding 50 percent decrease in the cost of the RRP program, from nearly $758 million in the first year to approximately $407 million in the second year.[31]

But no qualifying lead test kit ever entered the market that met both the negative-response and positive-response criteria. As of September 2016, only two approved test kits are available nationwide, but they meet *only* the negative-response criterion. This means they are likely to result in false positive readings, which deters both renovators and homeowners from using them. In December 2015, EPA acknowledged that the agency "is unaware of any lead test kit available *now or in the foreseeable future* that would meet *both* of the performance criteria." [32] More recently, EPA has indicated that a new test kit is under development and may reach the market in 2017, but few details have been provided.[33]

EPA has promised stakeholders a test kit since 2008 that has not been forthcoming. During that time, renovators have been compelled to use lead-safe work practices and take other steps that, in many instances, would not have been required if proper testing was available. Now, EPA is continuing its stalling tactic and suggesting that a new kit will be available soon, yet there is no indication that 2016 will be any different than 2008 or any reason to believe that a qualifying test kit is likely to emerge in the near future. EPA must revisit and revise the RRP rule's economic analysis to correct the flawed assumption that a reliable and affordable EPA-recognized test kit would be available and significantly reduce the number of homes affected by the rule. A revised analysis would provide the agency, stakeholders, and general public with a more accurate understanding of the RRP rule's true costs and benefits and allow EPA to make more reasoned decisions regarding the rule's scope and requirements.

a. A revised economic analysis likely will show significantly higher costs than EPA originally projected.

The RRP program's true costs likely are significantly higher than what EPA originally projected. Because no qualifying test kit exists, EPA has no basis for the dramatic cost reduction assumptions

[30] 2008 Rule Economic Analysis at 3; 2010 Amendment Economic Analysis at ES-4.

[31] 2008 Rule Economic Analysis at 5; 2010 Amendment Economic Analysis at ES-4 (Table ES-3).

[32] 80 Fed. Reg. at 79,336 (emphases added).

[33] While one company publicly has commented that it has a qualifying test kit under development, NAHB notes that there is no certainty regarding the alleged test kit's current status, including when (or if) it would come to market. To the best of NAHB's knowledge, the company has not yet submitted required validation data to EPA. NAHB would be happy to see a qualifying test kit enter the market. But *even if* such a test kit enters the market in 2016 or later, it would not change the fact that EPA's economic analysis for the RRP rule assumed a qualifying test kit would be available in mid-2011, and that NAHB's members have been implementing the RRP program for the past six years *without* a technology EPA relied on in seeking to minimize the impacts the rule would have on small businesses.

underlying the RRP rule —i.e., that both the number of buildings covered by the program and total program costs would be reduce d by nearly half in the program's second year. In reality, renovators are "over -applying" the rule out in the field. Without a reliable test kit or realistic alternative, renovators working on pre -1978 homes or child -occupied facilities must either (i) assume lead-based paint is present or (ii) use an available test kit that is prone to "false positive" results. Both options can cause a renovator to apply lead safe work practices in buildings that do not present any actual lead -based paint hazard. Accor ding to the U.S. Department of Housing and Urban Development (HUD), only 24 percent of homes built between 1960 and 1977 contain lead-based paint.[34] This means that when renovators assume that lead is present in these pre -1978 homes, it is likely that *76 percent of the time renovators are applying the rule in a home never intended to be covered by the program* .[35] This over -application of the rule imposes significant costs on renovators and homeowners without any corresponding benefit.[36]

In addition, EPA never has fully accounted for state requirements or other factors that limit the use of test kits. For example, some states place additional restrictions on test kit use. In Illinois, RRP-certified renovators are required to bring in a state-certified third party to conduct any lead paint testing. Such requirements mean that *even if* a qualifying test kit enters the market, its mere availability may not reduce program costs to the extent EPA assumed, due to limitations on its use.

b. EPA should amend or rescind the rule if a revised economic analysis shows that costs exceed benefits.

EPA should amend or rescind part or all of the RRP rule if performing a revised economic analysis reveals that the program's costs exceed its benefits. Under E.O. 12866, agencies s hould only adopt regulations whose benefits exceed their costs. E.O. 12866 also orders agencies to base regulatory decisions "on the *best reasonably obtainable scientific, technical, economic, and other*

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[34] HUD, *American Healthy Homes Survey: Lead and Arsenic Findings* (April 2011) at 14 (Table ES -1), available at http://portal.hud.gov/hudportal/documents/huddoc?id=AHHS_Report.pdf.

[35] EPA included the opt-out provision in the 2008 RRP rule to help address this concern about over-applying the rule. The 2010 amendment removed this provision. NAHB urges EPA to revisit the issue of an opt -out provision. Reincorporating an opt-out provision into the rule would help ensure that the program is effectively targeting the at-risk population and not being applied where lead-based paint hazards are not present. At a minimum, NAHB urges EPA to consider reinstating the opt -out for homes built after 196 0 because the overwhelming majority of those homes do not contain regulated levels of lead-based paint.

[36] It also exposes the regulated community to unnecessary liability risks. Once a certified renovator presumes the presence of lead, all of the rule's requirements go into effect. Should EPA initiate an inspection, that inspector likewise will presume the presence of l ead. Thus, despite the fact that the rule's enforcement is intended to be limited to the *actual creation of lead -based paint hazards* , renovators may face lengthy and invasive federal investigations and significant fines *even when a lead -based paint hazard never existed*. This runs counter to the intent of the RRP program as a whole and the test kit provisions in particular.

information concerning the need for and consequences of the intended regulation."[37] The lack of a qualifying test kit calls into question whether EPA would have adopted the program as it currently exists at all.

Indeed, rather than basing the economic analysis of the RRP rule on existing technology, EPA included extremely optimistic cost projections based on *an elusive lead test kit that is yet to be developed*. It is unclear whether the benefits of the rule would still exceed the costs if EPA performed the analysis *without* the test kit assumption. If a revised economic analysis shows that the rule's costs exceed its benefits, EPA should amend or rescind part or all of the rule accordingly. The Section 610 review process is an opportunity for EPA to finally undertake the analysis of economic impacts it should have undertaken at the start, and, if necessary, to revise its program design choices to help ensure that the program brings a net public benefit. In particular, EPA may need to reconsider its options for minimizing impacts on small businesses, such as reinstituting some form of the opt-out provision limiting the applicability of the rule to pre-1960 housing, revising the lead-safe work practices, and revisiting the training and recertification requirements.

2. EPA Should Address the RRP Program's Numerous Implementation Issues Previously Raised by NAHB (Factor 2)

NAHB previously has provided comments on and critiques of the RRP program—including the 2008 rule, its amendments, and related lead test rulemakings—in various comment letters, stakeholder meetings, and administrative and judicial filings. NAHB urges EPA to consider these previously raised concerns. The RRP program continues to be fraught with implementation issues, some of which have been present from the beginning and others which have emerged over time. NAHB highlights some of the major ongoing implementation issues below.

a. The new renovator recertification requirements are unnecessarily complex and burdensome.

EPA has set up a new renovator recertification system that is needlessly complex and burdensome. On February 17, 2016, EPA amended the RRP rule to, among other revisions, modify and streamline renovator refresher training requirements.[38] The amended rule sets up a new bifurcated recertification system with separate recertification schedules based on whether a renovator takes a refresher training course *with* or *without* a hands-on component. This new recertification process is *far more complicated and cumbersome* than the process the agency originally proposed. In July 2016, NAHB filed with EPA a petition for reconsideration of the rule amendment, arguing that adopting this bifurcated approach (i) creates additional burdens for

[37] § 1(b)(7) (emphasis added).

[38] EPA, *Lead-Based Paint Programs; Amendment to Jurisdiction-Specific Certification and Accreditation Requirements and Renovator Refresher Training Requirements*. 81 Fed. Reg. 7,987 (Feb. 17, 2016).

renovators; (ii) contradicts the agency's goals by reinstating burdens it sought to avoid; and (iii) violates the Administrative Procedure Act because the agency did not give proper notice to the regulated community.[39]

NAHB urges EPA to initiate a rulemaking to repeal those provisions of the 2016 rule amendment establishing the bifurcated recertification system.[40] EPA should re-introduce its original proposal to eliminate the hands-on component as a required element of a refresher course. NAHB has long advocated removing the hands-on training from the refresher course because it imposes an unnecessary burden on certified renovators. Contrary to the agency's goals, the new recertification system is needlessly complex and does not encourage renovators to remain RRP certified. It is likely to reduce the overall number of certified renovators in the program.[41]

b. Individual certified renovators should be provided the same resources provided to certified firms.

EPA does not provide individual renovators with the same resources as certified firms. Nor does EPA provide the general public with the same level of information about individual renovators as certified firms. For instance,

- EPA's online search function for locating certified renovators[42] *only* provides information about certified firms and training providers. It does not provide information about individual renovators.

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[39] NAHB, *Petition for Reconsideration on EPA's Final Rule: Lead-Based Paint Programs; Amendment to Jurisdiction-Specific Certification and Accreditation Requirements and Renovator Refresher Training Requirements* (July 5, 2016).

[40] Although EPA has not specifically solicited comment on this 2016 RRP rule amendment in the Section 610 review notice, the amendment poses serious RRP program concerns that relate to several of the required statutory factors, including the nature of complaints and comments received concerning the rule (factor 2) and the complexity of the rule (factor 3)

[41] Indeed, in March 2016, EPA reported that there were approximately 550,000 certified individual renovators. As of July 2016, this number had dropped to approximately 304,000 certified individual renovators (with just over 1,000 renovators taking the refresher training course without the hands-on component). This represents a nearly 45 percent reduction. *See* EPA, *US Environmental Protection Agency Regulatory Flexibility Act, Section 610 Review: Renovation, Repair & Painting Rule*, Presentation Slides from SBA Environmental Roundtable at 7 (Aug. 24, 2016). While some of the drop-off likely is attributable to other reasons (e.g., renovators now operating under a state-certified program), a significant portion likely is due to the complexity of the new refresher training/recertification requirements—especially in light of the large number of renovators whose certifications were set to expire on March 31, 2016. *See* EPA, *Lead-Based Paint Programs; Extension of Renovator Certifications*, 80 Fed. Reg. 20,444 (Apr. 16, 2015).

[42] *See* EPA, *Locate Certified Renovation and Lead Dust Sampling Technician Firms*, https://cfpub.epa.gov/flpp/pub/index.cfm?do=main.firmSearch (last accessed August 25, 2016).

- EPA allows certified firms to submit applications (for both certification and recertification), payments, updates, and certificate requests online.[43] Individual renovators do not have these options. Further, individual renovators who had their certifications extended via EPA's April 2015 final rule[44] had no means of receiving formal "extension" certificates. Instead, renovators were instructed to include a copy of the *Federal Register* notice with their certification paperwork. This created confusion and additional burdens for many NAHB members.

- EPA allows certified firms to order a copy of their certificate online.[45] Individual renovators do not have this option. This means that individual certified renovators have no centralized location from which to obtain a replacement certificate if needed. This has serious implications for individual renovators who obtained their original certificate from a trainer that is now out-of-business or otherwise unreachable.

NAHB appreciates EPA's efforts to develop website tools and other resources for certified firms. NAHB urges EPA to consider developing similar resources for individual certified renovators. This would help address some of the disparities between the burdens certified firms and individual certified renovators face, as well as the disparities in publicly available information. Overall, these changes would make the program more efficient and transparent, benefiting renovators and the public alike.

c. Regional disparity in recordkeeping protocols makes program compliance unnecessarily complicated.

EPA never has finalized a standardized recordkeeping form or established standardized protocols for filling out the sample form for renovators required to certify compliance with the RRP rule's training, work practice, and other requirements.[46] As a result, different regions maintain different protocols for filling out forms and maintaining records. For example, some renovators are allowed to "pre-fill" company information on the forms, while others cannot; some renovators are able to fill out all or portions of the forms online, while others must do so by hand. This regional disparity makes it difficult for NAHB to advise its members, who operate across many different regions and states, on the applicable protocols.

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[43] *See* EPA, *Apply for or Update Your Renovation Firm's Lead -Safe Certification Tod ay!*, https://www.epa.gov/lead/getcertified (last accessed August 25, 2016).

[44] 80 Fed. Reg. at 20,444.

[45] *See* EPA, *Lead Renovation/Abatement Firm Certification Application or Update* , https://www.epa.gov/lead/lead-renovationabatement-firm-certification-application-or-update (last accessed August 25, 2016).

[46] *See* 40 CFR § 745.86. EPA has provided a sample recordkeeping "checklist" form. *See id.* at § 745.86(c)(3). However, renovators are not required to use this form.

NAHB urges EPA to take steps to both (i) finalize a standardized recordkeeping form, by going through the full information collection request (ICR)/Office of Management and Budget (OMB) review process;[47] and (ii) establish a uniform set of protocols for filling out the form. Overall, standardized forms and protocols would simplify the program and eliminate burdens some renovators face in determining *how* they should satisfy the rule's recordkeeping requirements.

d. EPA Should Not Impose Quantitative Clearance Requirements

NAHB urges EPA not to amend the RRP rule to impose quantitative clearance test requirements. Doing so would exceed EPA's statutory authority, as the agency acknowledged in its decision in the 2011 RRP rule amendment not to promulgate testing and clearance requirements.[48] The RRP rule is intended to cover only lead-safe *renovation* activities, not lead *abatement* activities. Clearance testing activities fall under the statutory definition of "abatement" and thus are not properly considered renovation activities.[49] Even if EPA had authority to impose clearance testing requirements under the RRP rule, EPA should not do so because it would create additional and unnecessary implementation costs for an already burdensome, complex, and inefficient program. Moreover, EPA's own studies have affirmed that cleaning verification is sufficiently protective of public health.[50] Therefore, NAHB supports EPA's continued reliance on the "cleaning verification" process to ensure that regulated parties are following the RRP rule's requirements.

3. EPA's Section 610 Review Process is Deficient

EPA's Section 610 review process for the RR P rule is inadequate. The purpose of Section 610 review is to determine whether a rule "should be continued without change, or should be amended or rescinded, consistent with the stated objectives of applicable statutes, to minimize

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[47] EPA issued a draft ICR on recordkeeping requirements in January 2006. *See* EPA, *Notice of Proposed Rulemaking of Le ad; Renovation, Repair, and Painting Program* , 71 Fed. Reg. 1,588 (Jan. 10, 2006); EPA ICR No. 1715.07. However, EPA never issued a finalized recordkeeping form in response to the ICR. NAHB urges EPA to issue a revised ICR on recordkeeping requirements.

[48] 76 Fed. Reg. at 47,920 (Aug. 5, 2011) ("The RRP work practices are, in essence, requirements to ensure that renovators undertake traditional renovation activities . . . in a lead -safe way. EPA believes the RRP rule effectively minimizes exposure to hazard s generated by renovation activities *without imposing practices and disciplines that are outside the scope of traditional renovation activities.*") (emphasis added). Further, "EPA*did not design or intend* the RRP rule to address cleanup of pre -existing dust-lead hazards." *Id.* (emphasis added). "EPA recognizes that imposing a clearance requirement would be a departure from the balance struck in the RRP rule with respect to the distinction between abatement and renovations." *Id.* at 47,922 (emphasis added).

[49] *See* 15 U.S.C. § 2681 (1)(B) (defining "abatement" as "all preparation, cleanup, disposal, and *postabatement clearance testing activities* associated with such measures") (emphasis added).

[50] EPA, *Lead Exposure Associated with Renovation and Remodeling Ac tivities: Environmental Field Sampling Study* (1997); EPA, *Characterization of Dust Lead Levels after Renovation, Repair and Paining Activities* (2007).

any significant econom ic impact upon a substantial number of . . . small entities." [51] When an agency publishes notice of a Section 610 review, it "shall include a brief description of [the] rule and the need for and legal basis of such rule and shall invite public comment upon the rule."[52] However, the manner in which EPA has structured this Section 610 review undermines the ability of interested members of the public to participate in the process in a meaningful way.

EPA has not provided sufficient notice to the regulated comm unity to meet its Section 610 obligations. Although the statute requires only a "brief description" of the rule, EPA's notice for the RRP rule does little more than provide one -to-two sentence summaries of the rule and its various amendments and associated rulemakings. Only a single sentence appears (indirectly) to address the "need for" the rule.[53] There is no apparent attempt to explain the "legal basis" for the rule. Moreover, although not expressly required under the statute, EPA's notice gives no indication of the agency's *own* assessment of the RRP program, nor does it provide any of the agency's own analysis or data on the rule's implementation. Commenters cannot adequately respond to the five statutory Section 610 factors—beyond reiterating comments previously made to the agency—on the meager basis of what EPA has provided in the notice.

In short, EPA appears to be treating the Section 610 review process as a mere "check the box" exercise. For the Section 610 review process to be effective, NAHB u rges EPA to withdraw the current notice and re -issue it with a report analyzing the rule's performance to which commenters can respond.[54] This should include EPA's assessment of the five statutory factors, as well as EPA's responses to previously submittedcomments. The new notice also should clarify what information the agency seeks and how the agency intends to use the information it receives. At minimum, EPA should allow a second comment period after the agency prepares its draft report in response to the initial round of Section 610 comments.

This type of process would allow interested parties to provide more meaningful comments to EPA. Indeed, in the absence of the type of report suggested, members of the public would be unable to provide any meaning ful comment on at least one of the statutory factors (the nature of comments received concerning the rule). EPA is the only entity that can meaningfully address this factor. This type of process would result in something closer to what Congress intended (i.e., a meaningful assessment of a rule and its impacts on small businesses in light of experience with implementation of the rule).

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[51] 5 U.S.C. § 610(a). An agency must document the review and conclusions within ten years of the date a r ule was promulgated. *Id.*

[52] *Id.* at § 610(c).

[53] *See* 81 Fed. Reg. at 37,381 (defining the RRP rule in broad terms as "intended to reduce exposure to lead hazard created by renovation, repair, and painting activities that disturb lead-based paint").

[54] EPA has authority under Section 610 to amend its plan for reviewing a rule "at any time by publishing the revision in the *Federal Register*." 5 U.S.C. § 610(a).

In addition, EPA has not provided clarity about how this Section 610 review relates to the other ongoing stakeholder conversations regarding the RRP program. For instance, EPA states that the Section 610 review is "an additional opportunity" to comment on lead test kits, field testing alternatives, and unspecified "other broader RRP rule concerns." [55] NAHB does not believe that a Section 610 review is the appropriate place to continue the ongoing stakeholder conversation about test kits and lead testing alternatives. There is too much uncertainty as to how EPA will weigh information received (or *not* received, if stakeholders elect not to comment on the test kit issues[56]) via the Section 610 review process. It also is difficult to provide meaningful comment without feedback from EPA on prior comments submitted on these very same issues.

ADDITIONAL COMMENTS ON LEAD TEST KITS AND FIELD TESTING ALTERNATIVES

In addition to seeking comment on the Section 610 factors as they apply to the RRP rule, EPA is seeking broader feedback on lead test kits and field testing alternatives. As explained above, NAHB does not believe that a Section 610 review is the proper venue to continue the test kit stakeholder discussion. Nonetheless, NAHB offers the following comments on this critical issue.

1. There is no adequate existing field test alternative to lead test kits.

No existing lead test method can serve as an adequate substitute for a qualifying lead test kit. NAHB acknowledges that two alternative lead testing methods are available: paint chip testing and hand-held XRF testing. EPA evaluated both methods in developing the 2008 RRP rule, but dismissed these methods as infeasible and too expensive. Although EPA subsequently has approved both methods for use in the absence of a reliable test kit, renovators continue to face practical issues in using both methods.

First, paint chip analysis is not a field test. Once collected, the samples must be sent off to a certified laboratory for analysis. This causes project delays and increased costs. Additionally, certified renovators in some states (e.g., Illinois) are unable to conduct the paint chip sampling themselves and must schedule a third-party to come out and do the testing.

Second, while XRF analysis *is* a field test capable of providing immediate results, the method comes with several practical, economic, and regulatory barriers. These include certification and training requirements to operate the XRF testing device, capital investment in the XRF equipment, and delays from not having enough XRF devices and certified staff to perform timely testing at all potential job sites.

Neither paint chip analysis nor XRF analysis can serve as a functional equivalent to the quick, affordable, and reliable test kit method envisioned by EPA under the RRP rule. Further, both

[55] 81 Fed. Reg. at 37,381.

[56] EPA should not treat silence on any issue as an indication of satisfaction with the status quo.

methods would require renovators to meet additional training and certification requirements and/or rely upon third parties to perform lead testing. Putting such burdens on the regulated community serves as a disincentive to comply and runs contrary to EPA's original intent under the RRP rule.

2. EPA should limit the scope of the program to pre-1960 housing stock.

To help address the problems created by the lack of a reliable and practical lead paint testing method, EPA should limit the scope of the RRP program to homes built before 1960.[57] Pre-1960 homes are more likely to contain lead-based paint than homes built between 1960 and 1977. As described above, including 1960-1977 housing stock in the program results in "over-application" of the program. This leads to wasted time, effort, and money—undermining the program's ability to target resources where they are most needed. Higher renovation costs also create risks for homeowners by encouraging them to put off needed renovations, take on renovations themselves (without any of the protections provided by the RRP rule), or turn to uncertified contractors (again, without the rule's protections). NAHB urges EPA to narrow the rule's scope to cover only those homes most likely to contain lead-based paint and most likely to present an exposure risk to young children or pregnant women. Re-targeting the program will help ensure that the program works better in the future, not only for certified renovators but also for the clients and communities they serve.

CONCLUSION

NAHB appreciates the opportunity to comment on EPA's Section 610 review of the RRP rule—a rule with major real-world impacts for NAHB members. The demonstrably inadequate nature of EPA's original assessment of the economic impacts of the RRP rule on small businesses—and, therefore, the agency's flawed evaluation of how to minimize these impacts—as well as EPA's current obligation under Section 610 to assess the impacts of the rule cry out for a robust analysis of the RRP rule and its impacts on small businesses that does not rely on the unfounded hope that an adequate test kit will shortly be forthcoming.

To ensure a robust review, NAHB requests that EPA amend its Section 610 review plan for the RRP rule to provide better notice and clearer guidance to stakeholders. Should EPA proceed with the current Section 610 review plan, NAHB urges EPA to perform a revised economic analysis of the RRP rule (that does not assume a qualifying lead paint test kit will become available) and amend or rescind part or all of the rule accordingly. Further, NAHB encourages

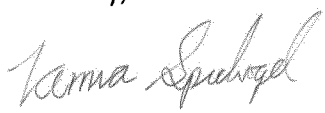
[57] In the preamble to the 2008 rule, EPA made a commitment that "if the improved test kits are not commercially available by September 2010, EPA will initiate rulemaking to extend the effective date of this final rule for 1 year with respect to owner-occupied target housing *built after 1960*." 73 Fed. Reg. at 21,713 (emphasis added). That time has come and gone, and EPA has failed to live up to its commitment. However, the Section 610 review process presents a new opportunity for EPA to examine the real-world implications of this failure and to look toward practical fixes to reform the program moving forward.

EPA to implement the other changes described in these comments to make the program more efficient and effective going forward.

NAHB stands ready to continue to work with EPA during this Section 610 review process and welcomes any opportunity to participate in follow-up meetings. As with any regulation, meaningful retrospective review of the program following implementation is key to identifying opportunities to improve, reduce unnecessary regulatory burdens, and eliminate unintended consequences without undermining program effectiveness and integrity or impeding the underlying environmental objective of the authorizing statute.

Please do not hesitate to contact me at (202) 266-8327 or tspielvogel@nahb.org if you have any questions or if you would like to discuss NAHB's comments further.

Sincerely,



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July 6, 2015

James Jones, Assistant Administrator
United States Environmental Protection Agency
Office of Chemical Safety and Pollution Prevention.
1200 Pennsylvania Ave. N.W., (7101M)
Washington, DC 20460

(Submitted electronically via website *www.regulations.gov*)

RE: Comments on Lead; Renovation, Repair and Painting Program; Lead Test Kit Stakeholder Meeting; Notice of Public Meeting (EPA–HQ–OPPT–2005–0049)

Dear Assistant Administrator Jones,

On May 14, 2015, U.S. Environmental Protection Agency (EPA) published a notice of public meeting in the *Federal Register* announcing a "Lead; Renovation, Repair and Painting Program; Lead Test Kit Stakeholder Meeting." [1] Acting in response to a Congressional directive EPA is seeking information related to:

1) The existing market for lead test kits as referenced in the 2008 Lead; Renovation, Repair and Painting Program rule;

2) The development or modification of lead test kit(s) that may meet the EPA's positive -response criterion (in addition to the negative -response criterion); and

3) Other alternatives for lead-based paint field testing.

The National Association of Home Builders (NAHB) appreciates the opportunity to provide comments on this important issue. The comments included in this letter are intended to supplement and expand upon those comment s made by NAHB member and former NAHB Remodelers Chair Bob Hanbury at the June 4, 2015 public meeting.

NAHB is a Washington, D.C. -based trade asso ciation representing over 140,000 builder and associate member firms that are organized inmore than 700 affiliated state and local associations in all fifty states, the District of Columbia, and Puerto Rico. The organization's membership includes those wh o design, construct, and supply single -family homes; build and manage multi -family, light commercial, and industrial structures; develop land; and remodel existing homes.

Over 80 percent of NAHB's members are classified as "small businesses," as defined by the U.S. Small Business Administration (SBA), 55,000 NAHB members indicate they are involved in remodeling, and NAHB members collectively employ over 3.4

[1] 80 *Federal Register* 27621-27623 (May 14, 2015)

million people nationwide. Collectively, NAHB's members will construct about 80% of the new housing units projected for 2015.

Overview

On April 22, 2008, EPA published the final rule for the Lead-Based Paint Renovation, Repair and Painting (RRP) program. This regulations established requirements, effective April 22, 2010, that contractors use lead -safe work practices during renovation, repair, and painting activities that disturb lead-based paint in target housing and child-occupied facilities built before 1978 unless a determination can be made that no lead-based paint would be disturbed during the renovation or repair. Among other provisions outlined in the 2008 rule, it was established by EPA that an EPA-recognized lead test kit, when used by a certified renovator, could be used to reliably determine whether federally regulated levels of lead-based paint is present. If regulated levels of lead-based paint[2] is not present there is no requirement to employ lead -safe work practices under the RRP rule. The rule was amended in 2010 by EPA when, among other provisions, the opportunity to opt-out was removed from the program. The opt-out allowed homeowners to affirmatively opt-out of the requirements of the RRP program when no children under six or pregnant women were present in the target housing under renovation . Elimination of the opt -out provision affected 39,886,000 units, according to the economic analysis prepared by EPA and resulted in the RRP rule covering millions of additional pre-1978 homes that were not previously subject to the rule. The 2010 amendments made no change to the use of the lead test kit or the assumptions EPA made regarding the ability to bring to market a commercially available, reliable, affordable lead -test kit that met all of the regulatory required criteria.

At the time the 2008 rule was finalized no available test kit met the criteri a established by EPA under the regulation. Under 40 CFR 745.88(c) for a lead test kit to be recognized by EPA it must meet separate negative -response and positive -response criteria which essentially relate to the probability of receiving false negative results and false positive results when using the test kit.

- 40 CFR 745.88(c)(1). The negative-response criterion states that for paint containing lead at or above the regulated level, 1.0 mg/cm2 or 0.5% by weight, a demonstrated probability (with 95% confidence) of a negative response less than or equal to 5% of the time must be met.

- 40 CFR 745.88(c)(1)-(2). The positive-response criterion states that for paint containing lead below the regulated level, 1.0 mg/cm2 or 0.5% by weight, a demonstrated probability (with 95% confidence) of a positive response less than or equal to 10% of the time must be met.

To date, there are only two lead test kits recognized by EPA and available nationwide and both have only met the negative-response criterion. EPA stated that this recognition will remain in effect until EPA announces recognition of the first test kit that meets both criteria established in the rule.[3] Under the regulation, all lead test kits recognized after September 1, 2010 must meet both the negative-response and positive-response criteria.

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[2] The standard is set at content levels that equal or exceed a level of 1.0 milligram per square centimeter (mg/cm2) or 0.5 percent by weight.
[3] http://www2.epa.gov/lead/lead-test-kits (accessed July 1, 2015)

The lack of a test kit meeting both response criteria was reflected in the required economic analysis which was prepared when the original regulations for the program were being finalized in 2008 and again when the program was amended in 2010. In both cases, the agency recognized that a test kit satisfying both criteria would not be available in the first year the rule was effective. However, EPA assumed that in year two of the program a qualified, recognized test kit would be available and on the market. Indeed, EPA estimated that the number of RRP renovation events would be reduced by almost half, from 8.4 million in the first year to 4.4 million in the second year, solely because of the availability of a qualified test kit.[4] EPA also projected a significant decrease in the cost of the RRP program from $758 million in the first year to $407 million in the second year.[5] Similar, though not identical, language was included in both analyses explaining EPA's assumptions:

> Because not all buildings built before 1978 have lead-based paint, the number of renovation events that need to use lead safe work practices (LSWP) is a subset of the total number of events covered by the rule. Currently available test kits for detecting whether lead-based paint is present have a high false positive rate resulting in the frequent use of lead safe work practices when they are not necessary, i.e., when lead-based paint is not present. EPA is working on the development of test kits that accurately identify both the presence and absence of lead in paint at levels that exceed the Federal standards. This analysis assumes that improved test kits will be in use starting in June 2011. Thus, the number of events with lead safe work practices is estimated to decrease from the first year to the second year because of the adoption of the improved test kits.[6]

NAHB has been actively engaged in EPA's lead -based paint program for the residential sector since its inception and has maintained a commitment over time to program implementation including consistently advocating on behalf of the remodeling industry on th e importance of obtaining and maintaining the required training and certification under EPA's RRP rule. In line with that commitment, NAHB has repeatedly raised concerns over the practical implications for the program resulting from the fact that a reliabl e pre-renovation test kit that can be used to determine if regulated levels of lead are present, as defined, on painted surfaces in pre -1978 structures has never been brought to market. In fact, EPA itself eloquently summarized the need for test kits in the announcement for the June 4th public meeting stating "lead test kits recognized by EPA should also serve as a quick, inexpensive, reliable, and easy to perform option for lead -based paint testing in the field."[7]

In June 2013, NAHB met with EPA to discussongoing work related to recognition of lead test kits. In a July 31, 2013 response letter to NAHB , EPA clearly stated that the agency would make no additional commitment of resources to foster the development of a test kit that would meet both the false negative and false positive criteria outlined in the RRP rule; nor would EPA provide any additional support for test kit research and d evelopment efforts by private companies. NAHB understands the fiscal constraints EPA has faced and the technical limitations that have limited

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[4] U.S. Environmental Protection Agency, (2008). *Economic Analysis for the TSCA Lead Renovation, Repair, and Painting Program Final Rule for Target Housing and Child-Occupied Facilities.*
[5] *Id.*
[6] U.S. Environmental Protection Agency, (2010). *Economic Analysis for the LRRP Opt-Out and Recordkeeping Final Rule.*
[7] 80 *Federal Register* 27623 (May 14, 2015)

advancements in developing a viable test kit. However, the decision by EPA to relinquish responsibility for a key component of the program on which the EPA economic analysis and subsequent program design choices were founded remains troubling.

As a result of EPA's decision, the RRP rule is increasingly applied to buildings that may otherwise have been excluded from the scope of the rule by a test kit that can accurately reflect the presence of regulated levels of lead-based paint. Without a reliable test kit, certified renovators must either assume lead-based paint is present and apply lead safe work practices, or use an EPA approved test kit with the knowledge that the results are likely to be inaccurate. Ultimately, renovators and their customers are left assuming the burden of additional costs and requirements associated with the rule – all without the reassurance that these burdens address a lead-based paint hazard.

Ensuring a structurally sound regulatory program that accurately reflects the on the ground realties faced by the remodeling industry will ultimately result in a more robust program overall. As it is currently being implemented the program is an inefficient tool for achieving the environmental and health goals of the underlying statute and regulation. The use of time, resources, and capitol on RRP renovation jobs that could otherwise have been deemed outside the rule's scope of coverage undermines the programs ability to target resources where they are most needed. The increased costs of these renovation jobs can also contribute to homeowners increasing their risk by putting off needed renovations, taking them on themselves or turning to uncertified contractors acting in violation of the rule.

As the representative from the U.S. Department of Housing and Urban Development raised during his statement at the public meeting, the lack of a test kit satisfying the RRP's requirements undermines the government's ability to meet both its responsibility to protect the health of the public and be good fiduciary stewards of the money it is entrusted to oversee. While he spoke in his role as a public servant, the same can be said for the relationship between renovators and their clients and paints a clear picture as to why the lack of a commercially available, reliable, affordable lead-test kit is such a concern for the remodeling industry.

Economic Analysis

The lead test kit status quo has concerned NAHB for many years as the economic analysis of the RRP rule conducted in 2008 for the final rule and for the 2010 amendments was predicated on the fact that a reliable, affordable field test kit would be available on the market in year two of the program. While some stakeholders will argue that the cost effectiveness of the testing option is not EPA's concern, under both the statute, existing Executive Orders, and related guidance documents EPA is required to be concerned with the cost effectiveness of the rule. First, as EPA has clearly acknowledged in the regulatory preamble to the 2008 final rule, the agency "as directed by TSCA section 2(c), considered the environmental, economic, and social impact of this rule."[8] In addition, the regulations for the RRP program have consistently been subject to interagency review under Executive Order (E.O.) 12866. Under E.O. 12866, "Regulatory Planning and Review,"[9] each agency is to identify and assess available alternatives to direct regulation and alternative forms of regulation to reduce costs and burdens. Agencies must also assess the costs and benefits of proposed regulations and only adopt those whose benefits justify their costs. Importantly, E.O. 12866 also requires agencies to base regulatory decisions "on the best

[8] 73 *Federal Register* 21701 (April 22, 2008)
[9] 58 Fed. Reg. 51,735 (Sept. 30, 1993).

reasonably obtainable scientific, technical, economic, and other information concerning the need for and consequences of the intended regulation."[10]

Furthermore, EPA was so confident that an improved test kit would be in use by the second year of the program th at in the preamble to the final rule in 2008 the Agency committed that "if the improved test kits are not commercially available by September 2010, EPA will initiate rulemaking to extend the effective date of this final rule for 1 year with respect to owner -occupied target housing built after 1960."[11] Quite obviously that time has come and gone and EPA has failed to hold up its commitments t o the regulated community. However, five years later the opportunity exists, through stakeholder engagement such as this, to examine what the real world implications of this failure have been and to look toward practical fixes to reform the program movingforward.

Existing Alternatives Can't Substitute For Lead Test-Kit

NAHB acknowledges that two additional testing methods currently exist but would remind EPA that both methods also existed at the time the rule was first being developed. The two testing options are hand held XRF testing and the submitting of paint chip samples for subsequent chemical analysis by an EPA accredited laboratory under the National Lead Laboratory Accreditation Program (NLLAP). NAHB continues to believe that neither of these two e xisting lead-based paint testing methods serves as substitutes for the reliable, affordable lead -based paint test kit that this rule was predicated on. Furthermore, EPA evaluated and dismissed both of these existing lead-based paint testing methods as both infeasible and too expen sive during the development of the original RRP rule for compliance with the rule. While both have subsequently been approved for use in the absence of a reliable test kit the practical issues renovators face when contemplating the use of either an XRF or paint chip analysis to test for the presence of lead-based paint illustrate why they cannot serve as a direct substitute for the test kit.

Paint chip analysis is not a field test. Once collected the samples must be sent off to a certified laboratory for an alysis costing the consumer money in the form of project delay and preventing the certified renovator from legally beginning work . Meanwhile, while XRF analysis can at least provide immediate results in the field there remain several practical, economic, and even regulatory barriers that will prevent XRF testing from ever serving as an equivalent tool to the quick, affordable, and reliable lead t est-kit envisioned by EPA under the final RRP rule. For example, in looking specifically at XRF testing the addition al costs , whether absorbed by a company directly or through contracting with an outside firm , can include meeting requirements for additional certification and training to operate the XRF testing device, capital investment in the XRF equipment, and the obvious delays resulting from a certified renovator having significantly more potential job sites requiring lead-based paint testing than available XRF devices and certified staff to operate the testing device. All of these factors contribute to the result that neither XRF nor paint chip analysis can serve as a functional equivalent of the lead test-kit as envisioned by the original rule. Finally, it would be contrary to the agency's original intent under the rule to require certified renovators to rely upon lead testing methods which they cannot perform themselves without subsequent training and certifications from both EPA and the states.

A Practitioner's Quagmire

For some renovators restrictions on the use of the test kits already exist at both the state and federal level due in part to the questionable reliability of the test kits. For others, operating in states such as Illinois, it is illegal for the RRP certified renovator to be the one testing for the

[10] *Id.* § 1(b)(7).
[11] 73 *Federal Register* 21713 (April 22, 2008)

presence of lead and they must bring in a state certified third party to do any testing. Couple all this with the broader regulatory and market constraints associated with other testing options (e.g. XRF) and most certified renovators are left with limited choices in the field.

Furthermore, homeowners subject to 1018 disclosure requirements must also grapple with the uncertainty of test kits. Despite the questionable reliability of the lead test kits homeowners must disclose any known results when they go to sell their property . While EPA and HUD have also encouraged homeowners to disclose information about the reliability of the tests the prospects of a false positive reading elevates concern for homeowners. As a result, the decision to act under the presumptive presence of lead may also be driven by the clients themselves faced with the lack of a test kit that meets both the positive and negative criteria of the regulation.

The resulting quagmire practitioners' face is that without a reliable, affordable field test kit or a cost competitive realistic alternative the most "reasonable" choice available has been to act under the presumptive presence of lead. I n other words, for any home or child occupied facility built before 1978 the renovator chooses to apply the requirements of the RRP rule despite the possibility that no lead-based paint is present. As a result, certified renovators are over applying the rule increasing the number of RRP events beyond any reasonable estimates for the program and creating an unnecessary burden on their businesses and their clients. According to EPA, as illustrated in Figure 1, 24 percent of homes built between 1960 and 1977 c ontain lead-based paint. As a result, when renovators act under the presumptive presence of lead in dealing with this segment of housing stock that means that 76 percent of the time the rule is likely being applied in a home never intended to be covered by the RRP rule. Applying this rule in such a manner doesn't serve to provide the desired health benefits or mitigate a hazard to pregnant women or children under 6 and goes well beyond the scope and intent of the statute and the regulation. In fact the opt-out was originally included by EPA in the 2008 rule to help address this concern of over application of the rule.

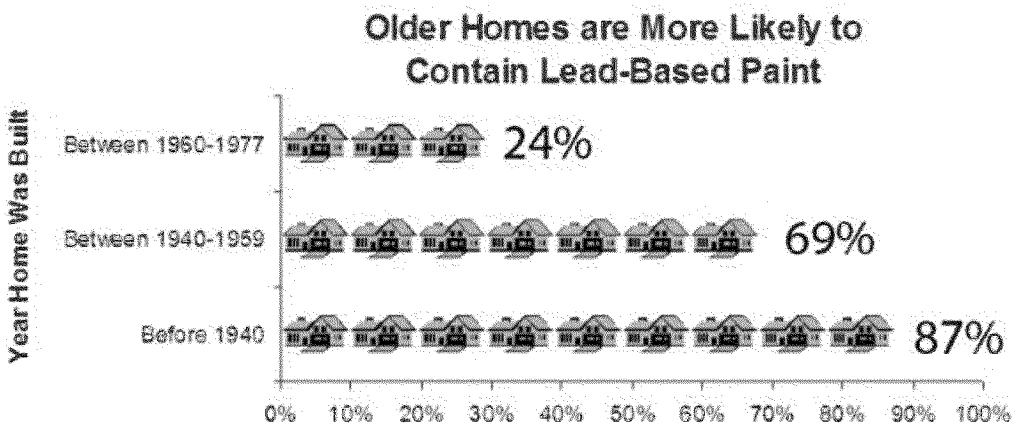

Figure 1[12]

In addition, acting under the presumption of presence not only results in an over -application of the rule increasing regulatory costs and reducing the efficiency and efficacy of the rule but it also opens up the regulated community to unnecessary liability concerns. Once a certified renovator presumes the presence of lead, then all requirements of the rule go in effect. Should EPA initiate an inspection, that inspector will likewise presume the presence of lead. Thus, despite the fact

[12] http://www2.epa.gov/lead/protect-your-family#sl-home (accessed on May 5, 2015)

that TSCA enforcement of the RRP rule is limited to actual creation of lead-based paint hazards[13], renovators may endure lengthy and invasive federal investigations and be forced to pay thousands in fines even though a lead-based paint hazard never existed.

The renovator will be subject to record keeping and work practice requirements equivalent to a work site where lead paint is known to be present and if an enforcement action is taken there will be no difference between the two sites. The potentially burdensome enforcement weight the regulated community finds itself voluntarily assuming because of a flawed regulatory structure runs counter to the intent of the test kit provisions and the design of the program as assumed in both the 2008 and 2010 economic analyses.

June 4, 2015 Stakeholder Meeting

NAHB is encouraged by the initiation of the stakeholder dialogue called for by Congress in the report language accompanying the FY 2015 Consolidated and Further Continuing Appropriations Act:

> The Agency is directed to prioritize efforts with stakeholders in fiscal year 2015 to identify solutions that would allow for a test kit to meet the criteria within the 2008 rule to reduce costs for consumers, remodelers and families to comply with the rule. If no solution is reached by the end of the fiscal year, EPA should revisit the test kit criteria in the 2008 rule and solicit public comment on alternatives.[14]

In addition, NAHB appreciates the ongoing nature of this dialogue and the opportunity to offer additional thoughts on issues raised at the June 4th meeting. While all federal lead based paint programs are ultimately moving to the same end – mitigating the hazards presented by exposure to lead based paint – they are by design very different programs. These programs are carried out by different agencies, under varying regulatory constraints and targeting different segments of the regulated community.

Regulated Level of Lead

The establishment of the regulated level of lead at 1.0 milligrams per square centimeter or equal to or in excess of 0.5% by weight was done through statute when Congress adopted the Residential Lead-based Paint Hazard Reduction Act of 1992.[15] Provisions were made to provide the Secretary of Housing and Urban Development (HUD) and the EPA Administrator with the ability to modify that level through regulation. However, only HUD can modify the regulated lead level as it applies to target housing units. As such, it is beyond the scope of EPA's current efforts to consider a change in the definition of lead-based paint for the purposes of the RRP program.

Despite this regulatory authority, HUD has taken a different approach and focused on funding research into test kits that would meet both the false positive and false negative criteria using the established regulated level of lead. Testimony was provided during the public meeting on June 4, 2015 from a HUD-funded company working to adapt existing test kits to address the issues that arise due to their sensitivity to the presence of lead in paint at levels well below the regulated level. NAHB commends HUD for its continued commitment to research despite the 2013 decision by EPA to end its research on lead test kits.

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[13] 15 U.S. Code § 2682(c)(3)
[14] Joint Explanatory Statement in the Congressional Record for P.L. No: 113-235
[15] P.L. 102-550

Renovation is not Abatement

Furthermore, at the June 4th meeting the discussion of the regulated level of lead was extended to also include the concept that EPA should examine whether RRP requirements be applied in situations where lead-based paint is present at lower than regulated levels. To do so would blur the line between the concepts of renovation, covered under RRP, and abatement, covered under separate EPA regulations. Under 40 CFR § 745.83 the term renovation is defined for the purposes of establishing the scope of covered activities under the RRP program. The regulation states that "[r]enovation means the modification of any existing structure, or portion thereof, that results in the disturbance of painted surfaces, unless that activity is performed as part of an abatement as defined by this part (40 CFR 745.223)." Through the establishment of this distinction, EPA clearly differentiated renovation activities from abatement activities speaking to the difference in intent, practice, and outcome associated with the two different types of activities. This distinction is critical given the presumption by some stakeholders that an examination of the test kit issue can and should result in a reexamination of the very foundation of this program.

EPA itself, in the preamble to the 2008 regulation, stated that "EPA is not interested in teaching persons how to be painters, plumbers, or carpenters. Rather, EPA's objective is to ensure that persons who already know how to perform renovations perform their typical work in a lead-safe manner."[16] As such, requiring RRP compliance when lead-based paint is present at lower than regulated levels would go beyond the scope of the current Congressional directive, would alter the foundation of the program, and exceed the statutory authority provided to the agency under 402(c)(3) of the Toxic Substances Control Act (TSCA).

While these are only two examples of items raised during the meeting NAHB would urge EPA to be extremely cautious in expanding the scope of the current undertaking. NAHB's recommendations have been narrowly tied to the absence of the test kit, a component of the regulation, and the potential remedies that may be a means of achieving the goals it was originally aimed at providing. While the inclusion of a yet to be developed technology in regulation can drive technological innovation that clearly has not occurred to date with regards to the RRP lead test kits. EPA should not sit back and ignore the reality of program implementation and the unintended consequences of what happens when practitioners must act absent that necessary technological innovation.

Next Steps

While NAHB applauds HUD for continuing research on test kits, and is pleased to see EPA seek stakeholder input, it is clear that a test kit meeting the Rule's requirements will not be available for the foreseeable future. In order to provide all parties with an adequate understanding of the RRP Rule's true costs and benefits, NAHB urges EPA to revisit and revise the economic analysis developed for the program. The Agency's original economic analysis for the RRP rule was predicated on a faulty assumption that presumed a commercially available, reliable, and affordable lead-based test kit that met the regulatory criteria would be available in year two of the program. In fact EPA estimated that once reliable test kits were available in the second year of the rule's implementation, the number of work sites covered by the rule would be cut in half.[17]

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[16] 73 *Federal Register* 21701 (April 22, 2008)
[17] U.S. Environmental Protection Agency. (2008). *Economic Analysis for the TSCA Lead Renovation, Repair, and Painting Program Final Rule for Target Housing and Child-Occupied Facilities.*

In reality, the lack of reliable test kits which meet both the positive and negative criteria as outlined in the 2008 RRP regulation calls into question EPA's original economic analysis upon which the requirements for the rule were based. Furthermore, the fact that the economic analysis for both the original 2008 regulation and the 2010 amendment were both predicated on this assumption undermines the validity of the data presented to the Office of Management and Budget during review of the rules under E.O. 12866. As such, it calls into question whether the program as it currently exists would have been adopted if the economic analysis would have been based on existing technology and not the development of an elusive test kit yet to be developed.

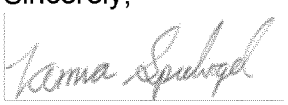
NAHB urges EPA to initiate as expeditiously as possible a review and revision of the economic analysis. A new economic analysis of the Residential RRP regulation should be conducted separate from actions EPA is undertaking in relation to other rulemaking proceedings and should take into account the underlying environmental, health and economic impacts of the RRP program. NAHB urges EPA to consider the adoption of measures that limit the scope of coverage and ensure that the estimated number of RRP events is more reflective of the goals and intents of the program. For example, EPA could limit the scope of housing stock covered by the regulation to homes built before 1960 which have a greater likelihood of containing lead-based paint. Furthermore, EPA could revisit the issue of an opt-out or other regulatory alternatives to ensure that the rule is effectively targeting the at risk population identified in the regulatory hazard finding avoiding application of the RRP program where lead-based paint hazards are not present.

The program as it is currently being implemented cannot efficiently target the underlying environmental and health goals it was established to meet. To address this deficiency EPA should act to narrow the targeted scope of the rule to cover those homes most likely to contain lead-based paint and those most likely to present an exposure risk to children under 6 or pregnant women. By effectively retargeting this program through an accurate economic analysis and a realistic evaluation of available tools and resources EPA will ensure that the RRP program moving forward works better for not only the certified renovators operating within the program but also for the clients and communities they serve.

Thank you for your consideration. NAHB staff and its members stand ready to work with EPA during the entirety of this stakeholder outreach process and welcome any opportunity to participate in individual follow-up meetings. As with any regulation, meaningful retrospective review of the program following implementation is key to identifying opportunities to improve the program, reduce unnecessary regulatory burdens and eliminate unintended consequences without undermining the effectiveness and integrity of the program or impeding the underlying environmental objective of the authorizing statute.

Please do not hesitate to contact me at (202) 266-8327 or tspielvogel@nahb.org if you have any questions or if you would like to discuss NAHB's comments further.

Sincerely,



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February 19, 2016

James Jones, Assistant Administrator
United States Environmental Protection Agency
Office of Chemical Safety and Pollution Prevention.
1200 Pennsylvania Ave. N.W., (7101M)
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(Submitted electronically via website *www.regulations.gov*)

RE: Comments on Lead; Renovation, Repair and Painting Program; Lead Test Kit; Notice of Opening of Comment Period (EPA–HQ–OPPT–2015–0780)

Dear Assistant Administrator Jones,

On December 21, 2015, U.S. Environmental Protection Agency (EPA) published a notice in the *Federal Register*[1] opening a second comment period to allow for further public comment in response to EPA's Fiscal Year 2015 Appropriations Act policy rider.

Specifically EPA is soliciting comment on the following potential lead test kit and field testing options raised by stakeholders during the initial comment period which opened on May 14, 2015 and included the June 4, 2015 public meeting.[2]

- Proposing to eliminate the positive response criterion;
- Proposing to modify the positive response criterion;
- Maintaining the current negative response and positive response criteria;
- Proposing to provide reduced Lead Renovation, Repair and Painting Program training requirements for X-Ray Fluorescence technicians; and
- Exploring any other lead -based paint field testing technology that would provide reduced costs for consumers, remodelers and families to comply with the RRP rule.

The National Association of Home Builders (NAHB) appreciates the opportunity to continue provide comments on this important issue. However, NAHB is concerned that most of the potential options EPA is currently requesting comment are neither new, innovative or truly provide a solution to the underlying problem. The comments included in this letter are intended to supplement and expand upon those comments already made by NAHB member and former NAHB Remodelers Chair Bob Hanbury at the June

[1] 80 *Federal Register* 79335-79336 (December 21, 2015)
[2] 80 *Federal Register* 27621-27623 (May 14, 2015)

4, 2015 public meeting and in the subsequent comment letter NAHB submitted for the record on July 6, 2015. In addition, NAHB wishes to incorporate by reference NAHB's prior comments on this matter submitted on July 6, 2015.

NAHB is a federation of more than 700 state and local home builder associations nationwide. The organization's membership includes over 140,000 firms engaged in land development, single and multifamily residential construction, remodeling, multifamily ownership and management, building material trades, building products manufacturing and supply, and commercial and light industrial construction projects.

Over 95 percent of NAHB's members are classified as "small businesses," as defined by the U.S. Small Business Administration, and NAHB members collectively employ over 3.4 million people nationwide. Four out of every five new homes are built by NAHB members. NAHB members are involved in the development and construction of for-sale single family homes for first-time and low- and moderate-income homebuyers, as well as the construction, ownership and management of multifamily rental housing, including affordable rental housing. NAHB's members and their activities are also subjected to numerous laws, regulations and policies issued and enforced at the federal, state and local level.

BACKGROUND & OVERVIEW

On April 22, 2008, EPA published the final rule for the Lead-Based Paint Renovation, Repair and Painting (RRP) program. The RRP rule requires contractors follow EPA prescribed lead-safe work practices during renovation, repair, and painting activities that disturb lead-based paint in target housing and child-occupied facilities built before 1978, unless a determination can be made prior to the renovation or repair, that no lead-based paint would be disturbed. Under the RRP rule a certified renovator using an EPA-recognized lead test kit, could reliably determine whether or not federally regulated levels of lead-based paint is present in a given work area. Under the final RRP rule if regulated levels of lead-based paint[3] are not present, then none of the lead-safe work practices requirements, pre-renovation distribution of EPA's notification pamphlet, post work documentation by a certified renovator of the performance of lead safe work practices, and recording keeping requirements apply. The rule was amended in 2010 by EPA when, among other provisions, the opportunity to opt-out was removed from the program. The opt-out allowed homeowners to affirmatively opt-out of the requirements of the RRP program when no children under six or pregnant women were present in the target housing under renovation. Elimination of the opt-out provision affected 39,886,000 units, according to the economic analysis prepared by EPA and resulted in the RRP rule covering millions of additional pre-1978 homes that were not previously subject to the rule. The 2010 amendments made no change to the use of the lead test kit or the assumptions EPA made regarding the ability to bring to market a commercially available, reliable, affordable lead test kit that met all of the regulatory required criteria.

To date, there are only two lead test kits recognized by EPA and available nationwide and both have only met the negative-response criterion. According to the *Federal Register* notice announcing the current comment period, "Based on stakeholder input, EPA is unaware of any lead test kit available now or in the

[3] The standard is set at content levels that equal or exceed a level of 1.0 milligram per square centimeter (mg/cm2) or 0.5 percent by weight.

foreseeable future that would meet both of the performance criteria."[4]

In acknowledgement of the current status of the test kit, Congress directed EPA ". . . to prioritize efforts with stakeholders in fiscal year 2015 to identify solutions that would allow for a test kit to meet the criteria within the 2008 rule to reduce costs for consumers, remodelers and families to comply with the rule. If no solution is reached by the end of the fiscal year, EPA should revisit the test kit criteria in the 2008 rule and solicit public comment on alternatives."[5]

As noted by EPA, "The use of an EPA -recognized lead test kit, when used by a trained professional, can reliably determine that regulated lead-based paint is not present by virtue of a negative result."[6] This has been the intent of the lead test kit since the original regulations for the program were finalized in 2008. As EPA so eloquently summarized in the announcement for the pub lic meeting "Qualitatively speaking, lead test kits recognized by EPA should also serve as a quick, inexpensive, reliable, and easy to perform option for lead-based paint testing in the field."[7] This ability, to determine in the field, whether lead-based paint is present at federally regulated amounts is an essential component of a functioning RRP rule, since there is no requirement under the RRP rule to employ lead -safe work practices if lead-based paint is not present in the work area at levels regulated by EPA/the federal government.

Absent the availability of a commercially available, reliable, affordable lead -test kit certified renovators must either assume lead -based paint is present and apply lead safe work practices, or use an EPA approved test kit with the knowledge that the results are likely to be inaccurate. Ultimately, renovators and their customers are left assuming the burden of additional costs and requirements associated with the rule – all without the reassurance that these burdens address a lead-based paint hazard.

Specifically, as has been raised previously by NAHB, the lack of an EPA approved lead-based paint test kit capable of meeting both response criteria was recognized by EPA under both economic analyses prepared for the RRP rule, f irst in 2008 when the original regulations for the program were being finalized, and again in 2010 when EPA decided to significantly expand the number of target housing units subject to the rule by removing the "opt out" provision. In both cases, the agen cy recognized that a test kit satisfying both the positive and negative test criterion would not be available in the first year the rule was effective. However, EPA assumed that by year two of the program an accurate EPA approved LBP test kit would be available and on the market.

EPA had estimated that the number of RRP renovation events subject to this rule would be reduced by almost half, from 8.4 million in the first year to 4.4 million in the second year, solely because of the availability of a qualifi ed LBP test kit. [8] EPA also projected a significant decrease in the cost of the RRP program from $758 million in the first year to $407 million in the second year. [9] Similar, though not

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[4] 80 *Federal Register* 79335 (December 21, 2015)
[5] Explanatory Statement, Consolidated and Further Continuing Appropriations Act, 2015
[6] 80 *Federal Register* 79335 (December 21, 2015)
[7] 80 *Federal Register* 27623 (May 14, 2015)
[8] U.S. Environmental Protection Agency, (2008). *Economic Analysis for the TSCA Lead Renovation, Repair, and Painting Program Final Rule for Target Housing and Child-Occupied Facilities.*
[9] Id.

identical, language was included in both economic analyses explaining EPA's assumptions:

> Because not all buildings built before 1978 have lead -based paint, the number of renovation events that need to use lead safe work practices (LSWP) is a subset of the total number of events covered by the rule. Currently available test ki ts for detecting whether lead -based paint is present have a high false positive rate resulting in the frequent use of lead safe work practices when they are not necessary, i.e., when lead-based paint is not present. EPA is working on the development of tes t kits that accurately identify both the presence and absence of lead in paint at levels that exceed the Federal standards. This analysis assumes that improved test kits will be in use starting in June 2011. Thus, the number of events with lead safe work practices is estimated to decrease from the first year to the second year because of the adoption of the improved test kits.[10]

EPA should move expeditiously to revisit the original regulation and reevaluate the economic analysis of the program as it was prem ised on bringing a qualified, recognized test kit to market in year two of the program. Today, almost six years later the program still struggles to come to terms with the lack of a fundamental tool promised to the regulated community to help implement the regulation despite commitments from the agency that it would take steps to address the issue in 2010 if improved test kits were not available.[11]

RESPONSE TO SPECIFIC LEAD TEST KIT AND FIELD TESTING OPTIONS PROVIDED BY STAKEHOLDERS

EPA is providing stakeho lders the opportunity during the current comment period to respond to recommendations the agency received from stakeholders. NAHB urges EPA to acknowledge that existing alternatives cannot substitute for nor serve the original intended purpose of the lead test-kit. The potential lead test kit and field testing options raised by stakeholders during the earlier public comment period are not sufficient to address the regulatory deficiencies present in the RRP program resulting from the failure to bring a comme rcially available, reliable, affordable lead -test kit upon which the existing requirements of the RRP rule were predicated on. NAHB looks forward to the anticipated Section 610 review scheduled to begin later this year and the opportunity it presents for EPA to truly tackle the issues at hand via retrospective review of the RRP rule as a whole.

Eliminate or modify the positive response criterion.

NAHB is highly concerned that any effort to modify the test kit criterion will only mask the existing problem and in fact create an entirely new issue of uncertainty for existing EPA approved lead-based paint test kits

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[10] U.S. Environmental Protection Agency, (2010). *Economic Analysis for the LRRP Opt-Out and Recordkeeping Final Rule.*

[11] As outlined in the preamble to the final RRP regulation "After reviewing the comments and weighing all of the factors, including EPA's expectation that the improved test kits will be commercially available by September 2010, EPA has decided not to include a phased implementation in this rulemaking. Therefore, this regulation will take effect at the same time for target housing and child occupied facilities regardless of whether they were built before or after 1960. Nonetheless, if the improved test kits ar e not commercially available by September 2010, EPA will initiate a rulemaking to extend the effective date of this final rule for 1 year with respect to owner-occupied target housing built after 1960." at 73 *Federal Register* 21712-21713 (April 22, 2008).

in the process. The current problem is that no commercially available lead-based paint test kit has been brought to market that has been able to pass both the positive and negative response criterion established by EPA. As previously reported by EPA this is due to the exceedance of false positives tied to issues with existing test kits sensitivity to the presence of lead in paint at levels well below the regulated level.

To modify or eliminate the positive response criterion would ease EPA's ability to certify an existing lead-based paint test kit for market. However, certified renovators w ould not be any more certain that they are being provided a field test kit that serves the purpose which it was intended. Certifying existing lead-based paint test kits that are sensitive to lead well below regulated levels would mean any positive field test could be indicating practices are needed at a site where they are not otherwise required.

Test kits would remain an unreliable means of determining the presence of lead for the purposes of the RRP program as lead safe work practices are only required where the presence of lead in paint has been established at the regulated level of lead, set at 1.0 milligrams per square centimeter or equal to or in excess of 0.5% by weight, which was done through statute when Congress adopted the Residential Lead-based Paint Hazard Reduction Act of 1992.[12]

The establishment of the regulated level of lead at 1.0 milligrams per square centimeter or equal to or in excess of 0.5% by weight was done through statute when Congress adopted the Residential Lead -based Paint Hazard Reduction Act of 1992. [13] Provisions were made to provide the Secretary of Housing and Urban Development (HUD) and the EPA Administrator with the regulatory authority to modify the regulated level of lead following a subsequent federal rulemaking process However, only HUD can modify the regulated lead level as it applies to target housing units. [14] As such, it is beyond the scope of EPA's current efforts to consider a change in the definition of lead -based paint for the purposes of the RRP program outright. Elimination or modification of the positive response criterion would result in a de facto change that similar exceeds the agency's authority.

Furthermore, certification of test kits that require lead safe work practices be applied in situations where lead-based paint is present at lower than regulated levels would blur the line between the concepts of renovation, covered under RRP, and abatement, covered under separate EPA regulations. Under 40 CFR § 745.83 the term renovation is defined for the purposes of establishing the scope of covered activities under the RRP program. The regulation states that "[r]enovation means the modification of any existing structure, or portion thereof, that results in the disturbance of painted surfaces, unless that activity is performed as part of an abatement as defined by this part (40 CFR 745.223)." Through the establishment of this distinction, EPA clearly differentiated renovation activities from abatement activities speaking to the difference in intent, practice, and outcome associated with the two different types of activities.

EPA itself, in the preamble to the 2008 regulation, stated that "EPA is not interested in teaching persons how to be painters, plumbers, or carpenters. Rather, EPA's objective is to ensure that persons who already know how to perform renovations perform their typical work in a lead-safe manner."[15] As such, requiring

[12] P.L. 102-550

[13] Id.

[14] As defined in section 302(c) of the Lead-Based Paint Poisoning Prevention Act.

[15] 73 *Federal Register* 21701 (April 22, 2008)

RRP compliance when lead -based paint is present at lower than federally regulated levels would go beyond the scope of the current Congressional directive, would alter the foundation of the program, and exceed the statutory authority provided to the agency under 402(c)(3) of the Toxic Substances Control Act (TSCA).

Modifications to XRF Training Requirements

Prior to responding to the specific proposal on X-Ray Fluorescence (XRF) testing, NAHB must remind the agency that XRF testing existed as a lead-based paint testing methodology at the time the rule was first being developed by EPA. EPA evaluated and dismissed XRF testing as both infeasible and too expensive during the development of the original regulation for compliance with the rule. Instead, as discussed above, the original regulations finalized in 2008 and the amendments to the program adopted in 2010 relied upon the development of new technology (the lead test kit) for field testing by certified renovators to comply with the regulation.

Furthermore, NAHB maintains that even should EPA modify existing requirements for operation of the XRF this testing methodology is not a one for one replacement for lead test kits. The proposal to "provide reduced Lead Renovation, Repair and Painting Program training requirements for X-Ray Fluorescence technicians" is vague and does not clearly illustrate what changes to current requirements would occur. Assuming the proposal intends to attempt to reduce the burden on certified renovators by eliminating the need to complete additional EPA training course as currently required there remain additional procurement, operation and maintenance costs for certified renovators. In addition, EPA would not be able to eliminate the ability for states to establish, as some already do, additional training requirements or inspection limitations including in states operating under the EPA run RRP program.

Initial capital costs of purchasing the unit coupled with the lifecycle maintenance costs for disposal of radioactive material will be substantial. Additionally, the time and costs associated with manufacturer training requirements will still be an additional burden above and beyond the RRP training required by EPA. Even if an individual certified renovator or certified firm chose to pursue this option these costs would likely limit the purchase to one per firm limiting their ability to simultaneously test at multiple sites. With a viable test kit such limitations would not be an issue for lead test kits as conceptualized in the development of the RRP program. Lead test kits were intended to be a field test that would be affordable and accessible for renovators at each job site without such limitations.

- Liability – for ownership, maintenance, calibration, readings, disposal. Expands concerns renovators already have with increased liability associated with taken on work in pre-1978 buildings. NAHB members have indicated that this can be a deciding factor in turning away work in certain areas.
- Additional issues regarding third party testing restrictions on the books in certain states which will not be affected

To internalize the function of XRF technician, certified renovators would be taking on a role that is outside its traditional scope of their profession thereby exceeding the intent of EPA's expectation for the program where they stated they wanted to help RRP professionals accomplish perform their typical work in a lead safe manner. Taken cumulatively, the remaining hurdles towards adoption by certified renovators of XRF

testing reinforce the fact that XRF is not a one for one replacement for lead test kits. If EPA's intent is to provide certified renovators with an alternative option that meets the original intent of the test kit than XRF testing does not accomplish this goal.

CONCLUSION

NAHB urges EPA to avoid creating further unintended consequence for the regulated community by attempting to forcibly equate alternative test kit and field testing options that cannot substitute for nor serve the original intended purpose of an affordable, accurate, commercially available EPA approved lead test kit under the existing RRP rule. Since EPA's own analysis and rationale for the existing RRP rule was premised on the existence of such a lead-based paint test kit having already been brought to the market. In light of this glaring deficiency under the existing RRP rule NAHB urges EPA to shift its focus to a more comprehensive examination of the existing scope of the RRP rule accounting for the absence of an affordable, accurate, and commercially available lead-based paint test kit as originally envisioned by the agency and ensure that the RRP rule's requirements do not continue to be misapplied on such a widespread basis.

Thank you for your consideration. NAHB staff and its members stand ready to work with EPA during the entirety of this stakeholder outreach process and welcome any opportunity to participate in individual follow-up meetings. As with any regulation, meaningful retrospective review of the program following implementation is key to identifying opportunities to improve the program, reduce unnecessary regulatory burdens and eliminate unintended consequences without undermining the effectiveness and integrity of the program or impeding the underlying environmental objective of the authorizing statute.

Please do not hesitate to contact me at (202) 2668327 or tspielvogel@nahb.org if you have any questions or if you would like to discuss NAHB's comments further.

Sincerely,

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July 6, 2015

James Jones, Assistant Administrator
United States Environmental Protection Agency
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(Submitted electronically via website *www.regulations.gov*)

RE: Comments on Lead; Renovation, Repair and Painting Program; Lead Test Kit Stakeholder Meeting; Notice of Public Meeting (EPA–HQ–OPPT–2005–0049)

Dear Assistant Administrator Jones,

On May 14, 2015, U.S. Environmental Protection Agency (EPA) published a notice of public meeting in the *Federal Register* announcing a "Lead; Renovation, Repair and Painting Program; Lead Test Kit Stakeholder Meeting." [1] Acting in response to a Congressional directive EPA is seeking information related to:

1) The existing market for lead test kits as referenced in the 2008 Lead; Renovation, Repair and Painting Program rule;

2) The development or modification of lead test kit(s) that may meet the EPA's positive -response criterion (in addition to the negative -response criterion); and

3) Other alternatives for lead-based paint field testing.

The National Association of Home Builders (NAHB) appreciates the opportunity to provide comments on this important issue. The comments included in this letter are intended to supplement and expand upon those comment s made by NAHB member and former NAHB Remodelers Chair Bob Hanbury at the June 4, 2015 public meeting.

NAHB is a Washington, D.C. -based trade asso ciation representing over 140,000 builder and associate member firms that are organized inmore than 700 affiliated state and local associations in all fifty states, the District of Columbia, and Puerto Rico. The organization's membership includes those wh o design, construct, and supply single - family homes; build and manage multi -family, light commercial, and industrial structures; develop land; and remodel existing homes.

Over 80 percent of NAHB's members are classified as "small businesses," as defined by the U.S. Small Business Administration (SBA), 55,000 NAHB members indicate they are involved in remodeling, and NAHB members collectively employ over 3.4

[1] 80 *Federal Register* 27621-27623 (May 14, 2015)

million people nationwide. Collectively, NAHB's members will construct about 80% of the new housing units projected for 2015.

Overview

On April 22, 2008, EPA published the final rule for the Lead-Based Paint Renovation, Repair and Painting (RRP) program. This regulations established requirements, effective April 22, 2010, that contractors use lead -safe work practices during renovation, repair, and painting activities that disturb lead-based paint in target housing and child-occupied facilities built before 1978 unless a determination can be made that no lead-based paint would be disturbed during the renovation or repair. Among other provisions outlined in the 2008 rule, it was established by EPA that an EPA-recognized lead test kit, when used by a certified renovator, could be used to reliably determine whether federally regulated levels of lead-based paint is present. If regulated levels of lead-based paint[2] is not present there is no requirement to employ lead -safe work practices under the RRP rule. The rule was amended in 2010 by EPA when, among other provisions, the opportunity to opt-out was removed from the program. The opt-out allowed homeowners to affirmatively opt-out of the requirements of the RRP program when no children under six or pregnant women were present in the target housing under renovation . Elimination of the opt -out provision affected 39,886,000 units, according to the economic analysis prepared by EPA and resulted in the RRP rule covering millions of additional pre-1978 homes that were not previously subject to the rule. The 2010 amendments made no change to the use of the lead test kit or the assumptions EPA made regarding the ability to bring to market a commercially available, reliable, affordable lead -test kit that met all of the regulatory required criteria.

At the time the 2008 rule was finalized no available test kit met the criteri a established by EPA under the regulation. Under 40 CFR 745.88(c) for a lead test kit to be recognized by EPA it must meet separate negative -response and positive -response criteria which essentially relate to the probability of receiving false negative results and false positive results when using the test kit.

- 40 CFR 745.88(c)(1). The negative-response criterion states that for paint containing lead at or above the regulated level, 1.0 mg/cm2 or 0.5% by weight, a demonstrated probability (with 95% confidence) of a negative response less than or equal to 5% of the time must be met.

- 40 CFR 745.88(c)(1)-(2). The positive-response criterion states that for paint containing lead below the regulated level, 1.0 mg/cm2 or 0.5% by weight, a demonstrated probability (with 95% confidence) of a positive response less than or equal to 10% of the time must be met.

To date, there are only two lead test kits recognized by EPA and available nationwide and both have only met the negative-response criterion. EPA stated that this recognition will remain in effect until EPA announces recognition of the first test kit that meets both criteria established in the rule.[3] Under the regulation, all lead test kits recognized after September 1, 2010 must meet both the negative-response and positive-response criteria.

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[2] The standard is set at content levels that equal or exceed a level of 1.0 milligram per square centimeter (mg/cm2) or 0.5 percent by weight.
[3] http://www2.epa.gov/lead/lead-test-kits (accessed July 1, 2015)

The lack of a test kit meeting both response criteria was reflected in the required economic analysis which was prepared when the original regulations for the program were being finalized in 2008 and again when the program was amended in 2010. In both cases, the agency recognized that a test kit satisfying both criteria would not be available in the first year the rule was effective. However, EPA assumed that in year two of the program a qualified, recognized test kit would be available and on the market. Indeed, EPA estimated that the number of RRP renovation events would be reduced by almost half, from 8.4 million in the first year to 4.4 million in the second year, solely because of the availability of a qualified test kit.[4] EPA also projected a significant decrease in the cost of the RRP program from $758 million in the first year to $407 million in the second year.[5] Similar, though not identical, language was included in both analyses explaining EPA's assumptions:

> Because not all buildings built before 1978 have lead-based paint, the number of renovation events that need to use lead safe work practices (LSWP) is a subset of the total number of events covered by the rule. Currently available test kits for detecting whether lead-based paint is present have a high false positive rate resulting in the frequent use of lead safe work practices when they are not necessary, i.e., when lead-based paint is not present. EPA is working on the development of test kits that accurately identify both the presence and absence of lead in paint at levels that exceed the Federal standards. This analysis assumes that improved test kits will be in use starting in June 2011. Thus, the number of events with lead safe work practices is estimated to decrease from the first year to the second year because of the adoption of the improved test kits.[6]

NAHB has been actively engaged in EPA's lead -based paint program for the residential sector since its inception and has maintained a commitment over time to program implementation including consistently advocating on behalf of the remodeling industry on th e importance of obtaining and maintaining the required training and certification under EPA's RRP rule. In line with that commitment, NAHB has repeatedly raised concerns over the practical implications for the program resulting from the fact that a reliabl e pre-renovation test kit that can be used to determine if regulated levels of lead are present, as defined, on painted surfaces in pre -1978 structures has never been brought to market. In fact, EPA itself eloquently summarized the need for test kits in the announcement for the June 4th public meeting stating "lead test kits recognized by EPA should also serve as a quick, inexpensive, reliable, and easy to perform option for lead -based paint testing in the field."[7]

In June 2013, NAHB met with EPA to discussongoing work related to recognition of lead test kits. In a July 31, 2013 response letter to NAHB , EPA clearly stated that the agency would make no additional commitment of resources to foster the development of a test kit that would meet both the false negative and false positive criteria outlined in the RRP rule; nor would EPA provide any additional support for test kit research and d evelopment efforts by private companies. NAHB understands the fiscal constraints EPA has faced and the technical limitations that have limited

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[4] U.S. Environmental Protection Agency, (2008). *Economic Analysis for the TSCA Lead Renovation, Repair, and Painting Program Final Rule for Target Housing and Child-Occupied Facilities.*
[5] *Id.*
[6] U.S. Environmental Protection Agency, (2010). *Economic Analysis for the LRRP Opt-Out and Recordkeeping Final Rule.*
[7] 80 *Federal Register* 27623 (May 14, 2015)

advancements in developing a viable test kit. However, the decision by EPA to relinquish responsibility for a key component of the program on which the EPA economic analysis and subsequent program design choices were founded remains troubling.

As a result of EPA's decision, the RRP rule is increasingly applied to buildings that may otherwise have been excluded from the scope of the rule by a test kit that can accurately reflect the presence of regulated levels of lead-based paint. Without a reliable test kit, certified renovators must either assume lead-based paint is present and apply lead safe work practices, or use an EPA approved test kit with the knowledge that the results are likely to be inaccurate. Ultimately, renovators and their customers are left assuming the burden of additional costs and requirements associated with the rule – all without the reassurance that these burdens address a lead-based paint hazard.

Ensuring a structurally sound regulatory program that accurately reflects the on the ground realties faced by the remodeling industry will ultimately result in a more robust program overall. As it is currently being implemented the program is an inefficient tool for achieving the environmental and health goals of the underlying statute and regulation. The use of time, resources, and capitol on RRP renovation jobs that could otherwise have been deemed outside the rule's scope of coverage undermines the programs ability to target resources where they are most needed. The increased costs of these renovation jobs can also contribute to homeowners increasing their risk by putting off needed renovations, taking them on themselves or turning to uncertified contractors acting in violation of the rule.

As the representative from the U.S. Department of Housing and Urban Development raised during his statement at the public meeting, the lack of a test kit satisfying the RRP's requirements undermines the government's ability to meet both its responsibility to protect the health of the public and be good fiduciary stewards of the money it is entrusted to oversee. While he spoke in his role as a public servant, the same can be said for the relationship between renovators and their clients and paints a clear picture as to why the lack of a commercially available, reliable, affordable lead-test kit is such a concern for the remodeling industry.

Economic Analysis

The lead test kit status quo has concerned NAHB for many years as the economic analysis of the RRP rule conducted in 2008 for the final rule and for the 2010 amendments was predicated on the fact that a reliable, affordable field test kit would be available on the market in year two of the program. While some stakeholders will argue that the cost effectiveness of the testing option is not EPA's concern, under both the statute, existing Executive Orders, and related guidance documents EPA is required to be concerned with the cost effectiveness of the rule. First, as EPA has clearly acknowledged in the regulatory preamble to the 2008 final rule, the agency "as directed by TSCA section 2(c), considered the environmental, economic, and social impact of this rule."[8] In addition, the regulations for the RRP program have consistently been subject to interagency review under Executive Order (E.O.) 12866. Under E.O. 12866, "Regulatory Planning and Review,"[9] each agency is to identify and assess available alternatives to direct regulation and alternative forms of regulation to reduce costs and burdens. Agencies must also assess the costs and benefits of proposed regulations and only adopt those whose benefits justify their costs. Importantly, E.O. 12866 also requires agencies to base regulatory decisions "on the best

[8] 73 *Federal Register* 21701 (April 22, 2008)
[9] 58 Fed. Reg. 51,735 (Sept. 30, 1993).

reasonably obtainable scientific, technical, economic, and other information concerning the need for and consequences of the intended regulation."[10]

Furthermore, EPA was so confident that an improved test kit would be in use by the second year of the program th at in the preamble to the final rule in 2008 the Agency committed that "if the improved test kits are not commercially available by September 2010, EPA will initiate rulemaking to extend the effective date of this final rule for 1 year with respect to owner -occupied target housing built after 1960."[11] Quite obviously that time has come and gone and EPA has failed to hold up its commitments t o the regulated community. However, five years later the opportunity exists, through stakeholder engagement such as this, to examine what the real world implications of this failure have been and to look toward practical fixes to reform the program movingforward.

Existing Alternatives Can't Substitute For Lead Test-Kit

NAHB acknowledges that two additional testing methods currently exist but would remind EPA that both methods also existed at the time the rule was first being developed. The two testing options are hand held XRF testing and the submitting of paint chip samples for subsequent chemical analysis by an EPA accredited laboratory under the National Lead Laboratory Accreditation Program (NLLAP). NAHB continues to believe that neither of these two e xisting lead-based paint testing methods serves as substitutes for the reliable, affordable lead -based paint test kit that this rule was predicated on. Furthermore, EPA evaluated and dismissed both of these existing lead-based paint testing methods as both infeasible and too expen sive during the development of the original RRP rule for compliance with the rule. While both have subsequently been approved for use in the absence of a reliable test kit the practical issues renovators face when contemplating the use of either an XRF or paint chip analysis to test for the presence of lead-based paint illustrate why they cannot serve as a direct substitute for the test kit.

Paint chip analysis is not a field test. Once collected the samples must be sent off to a certified laboratory for an alysis costing the consumer money in the form of project delay and preventing the certified renovator from legally beginning work . Meanwhile, while XRF analysis can at least provide immediate results in the field there remain several practical, economic, and even regulatory barriers that will prevent XRF testing from ever serving as an equivalent tool to the quick, affordable, and reliable lead t est-kit envisioned by EPA under the final RRP rule. For example, in looking specifically at XRF testing the addition al costs , whether absorbed by a company directly or through contracting with an outside firm , can include meeting requirements for additional certification and training to operate the XRF testing device, capital investment in the XRF equipment, and the obvious delays resulting from a certified renovator having significantly more potential job sites requiring lead-based paint testing than available XRF devices and certified staff to operate the testing device. All of these factors contribute to the result that neither XRF nor paint chip analysis can serve as a functional equivalent of the lead test-kit as envisioned by the original rule. Finally, it would be contrary to the agency's original intent under the rule to require certified renovators to rely upon lead testing methods which they cannot perform themselves without subsequent training and certifications from both EPA and the states.

A Practitioner's Quagmire

For some renovators restrictions on the use of the test kits already exist at both the state and federal level due in part to the questionable reliability of the test kits. For others, operating in states such as Illinois, it is illegal for the RRP certified renovator to be the one testing for the

[10] *Id.* § 1(b)(7).
[11] 73 *Federal Register* 21713 (April 22, 2008)

presence of lead and they must bring in a state certified third party to do any testing. Couple all this with the broader regulatory and market constraints associated with other testing options (e.g. XRF) and most certified renovators are left with limited choices in the field.

Furthermore, homeowners subject to 1018 disclosure requirements must also grapple with the uncertainty of test kits. Despite the questionable reliability of the lead test kits homeowners must disclose any known results when they go to sell their property . While EPA and HUD have also encouraged homeowners to disclose information about the reliability of the tests the prospects of a false positive reading elevates concern for homeowners. As a result, the decision to act under the presumptive presence of lead may also be driven by the clients themselves faced with the lack of a test kit that meets both the positive and negative criteria of the regulation.

The resulting quagmire practitioners' face is that without a reliable, affordable field test kit or a cost competitive realistic alternative the most "reasonable" choice available has been to act under the presumptive presence of lead. I n other words, for any home or child occupied facility built before 1978 the renovator chooses to apply the requirements of the RRP rule despite the possibility that no lead-based paint is present. As a result, certified renovators are over applying the rule increasing the number of RRP events beyond any reasonable estimates for the program and creating an unnecessary burden on their businesses and their clients. According to EPA, as illustrated in Figure 1, 24 percent of homes built between 1960 and 1977 c ontain lead-based paint. As a result, when renovators act under the presumptive presence of lead in dealing with this segment of housing stock that means that 76 percent of the time the rule is likely being applied in a home never intended to be covered by the RRP rule. Applying this rule in such a manner doesn't serve to provide the desired health benefits or mitigate a hazard to pregnant women or children under 6 and goes well beyond the scope and intent of the statute and the regulation. In fact the opt-out was originally included by EPA in the 2008 rule to help address this concern of over application of the rule.

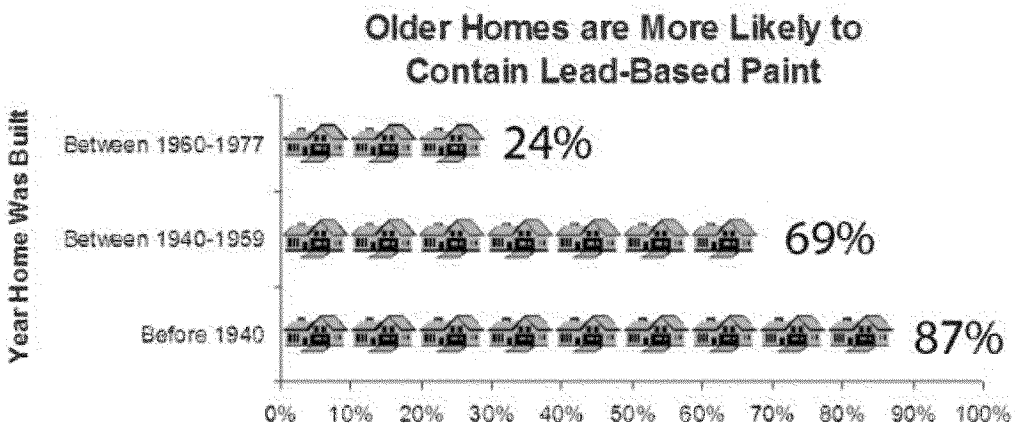

Figure 1[12]

In addition, acting under the presumption of presence not only results in an over -application of the rule increasing regulatory costs and reducing the efficiency and efficacy of the rule but it also opens up the regulated community to unnecessary liability concerns. Once a certified renovator presumes the presence of lead, then all requirements of the rule go in effect. Should EPA initiate an inspection, that inspector will likewise presume the presence of lead. Thus, despite the fact

[12] http://www2.epa.gov/lead/protect-your-family#sl-home (accessed on May 5, 2015)

that TSCA enforcement of the RRP rule is limited to actual creation of lead-based paint hazards[13], renovators may endure lengthy and invasive federal investigations and be forced to pay thousands in fines even though a lead-based paint hazard never existed.

The renovator will be subject to record keeping and work practice requirements equivalent to a work site where lead paint is known to be present and if an enforcement action is taken there will be no difference between the two sites. The potentially burdensome enforcement weight the regulated community finds itself voluntarily assuming because of a flawed regulatory structure runs counter to the intent of the test kit provisions and the design of the program as assumed in both the 2008 and 2010 economic analyses.

June 4, 2015 Stakeholder Meeting

NAHB is encouraged by the initiation of the stakeholder dialogue called for by Congress in the report language accompanying the FY 2015 Consolidated and Further Continuing Appropriations Act:

> The Agency is directed to prioritize efforts with stakeholders in fiscal year 2015 to identify solutions that would allow for a test kit to meet the criteria within the 2008 rule to reduce costs for consumers, remodelers and families to comply with the rule. If no solution is reached by the end of the fiscal year, EPA should revisit the test kit criteria in the 2008 rule and solicit public comment on alternatives.[14]

In addition, NAHB appreciates the ongoing nature of this dialogue and the opportunity to offer additional thoughts on issues raised at the June 4th meeting. While all federal lead based paint programs are ultimately moving to the same end – mitigating the hazards presented by exposure to lead based paint – they are by design very different programs. These programs are carried out by different agencies, under varying regulatory constraints and targeting different segments of the regulated community.

Regulated Level of Lead

The establishment of the regulated level of lead at 1.0 milligrams per square centimeter or equal to or in excess of 0.5% by weight was done through statute when Congress adopted the Residential Lead-based Paint Hazard Reduction Act of 1992.[15] Provisions were made to provide the Secretary of Housing and Urban Development (HUD) and the EPA Administrator with the ability to modify that level through regulation. However, only HUD can modify the regulated lead level as it applies to target housing units. As such, it is beyond the scope of EPA's current efforts to consider a change in the definition of lead-based paint for the purposes of the RRP program.

Despite this regulatory authority, HUD has taken a different approach and focused on funding research into test kits that would meet both the false positive and false negative criteria using the established regulated level of lead. Testimony was provided during the public meeting on June 4, 2015 from a HUD-funded company working to adapt existing test kits to address the issues that arise due to their sensitivity to the presence of lead in paint at levels well below the regulated level. NAHB commends HUD for its continued commitment to research despite the 2013 decision by EPA to end its research on lead test kits.

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[13] 15 U.S. Code § 2682(c)(3)
[14] Joint Explanatory Statement in the Congressional Record for P.L. No: 113-235
[15] P.L. 102-550

Renovation is not Abatement

Furthermore, at the June 4th meeting the discussion of the regulated level of lead was extended to also include the concept that EPA should examine whether RRP requirements be applied in situations where lead-based paint is present at lower than regulated levels. To do so would blur the line between the concepts of renovation, covered under RRP, and abatement, covered under separate EPA regulations. Under 40 CFR § 745.83 the term renovation is defined for the purposes of establishing the scope of covered activities under the RRP program. The regulation states that "[r]enovation means the modification of any existing structure, or portion thereof, that results in the disturbance of painted surfaces, unless that activity is performed as part of an abatement as defined by this part (40 CFR 745.223)." Through the establishment of this distinction, EPA clearly differentiated renovation activities from abatement activities speaking to the difference in intent, practice, and outcome associated with the two different types of activities. This distinction is critical given the presumption by some stakeholders that an examination of the test kit issue can and should result in a reexamination of the very foundation of this program.

EPA itself, in the preamble to the 2008 regulation, stated that "EPA is not interested in teaching persons how to be painters, plumbers, or carpenters. Rather, EPA's objective is to ensure that persons who already know how to perform renovations perform their typical work in a lead-safe manner."[16] As such, requiring RRP compliance when lead-based paint is present at lower than regulated levels would go beyond the scope of the current Congressional directive, would alter the foundation of the program, and exceed the statutory authority provided to the agency under 402(c)(3) of the Toxic Substances Control Act (TSCA).

While these are only two examples of items raised during the meeting NAHB would urge EPA to be extremely cautious in expanding the scope of the current undertaking. NAHB's recommendations have been narrowly tied to the absence of the test kit, a component of the regulation, and the potential remedies that may be a means of achieving the goals it was originally aimed at providing. While the inclusion of a yet to be developed technology in regulation can drive technological innovation that clearly has not occurred to date with regards to the RRP lead test kits. EPA should not sit back and ignore the reality of program implementation and the unintended consequences of what happens when practitioners must act absent that necessary technological innovation.

Next Steps

While NAHB applauds HUD for continuing research on test kits, and is pleased to see EPA seek stakeholder input, it is clear that a test kit meeting the Rule's requirements will not be available for the foreseeable future. In order to provide all parties with an adequate understanding of the RRP Rule's true costs and benefits, NAHB urges EPA to revisit and revise the economic analysis developed for the program. The Agency's original economic analysis for the RRP rule was predicated on a faulty assumption that presumed a commercially available, reliable, and affordable lead-based test kit that met the regulatory criteria would be available in year two of the program. In fact EPA estimated that once reliable test kits were available in the second year of the rule's implementation, the number of work sites covered by the rule would be cut in half.[17]

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[16] 73 *Federal Register* 21701 (April 22, 2008)
[17] U.S. Environmental Protection Agency. (2008). *Economic Analysis for the TSCA Lead Renovation, Repair, and Painting Program Final Rule for Target Housing and Child-Occupied Facilities.*

In reality, the lack of reliable test kits which meet both the positive and negative criteria as outlined in the 2008 RRP regulation calls into question EPA's original economic analysis upon which the requirements for the rule were based. Furthermore, the fact that the economic analysis for both the original 2008 regulation and the 2010 amendment were both predicated on this assumption undermines the validity of the data presented to the Office of Management and Budget during review of the rules under E.O. 12866. As such, it calls into question whether the program as it currently exists would have been adopted if the economic analysis would have been based on existing technology and not the development of an elusive test kit yet to be developed.

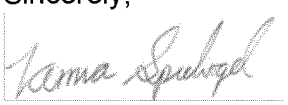
NAHB urges EPA to initiate as expeditiously as possible a review and revision of the economic analysis. A new economic analysis of the Residential RRP regulation should be conducted separate from actions EPA is undertaking in relation to other rulemaking proceedings and should take into account the underlying environmental, health and economic impacts of the RRP program. NAHB urges EPA to consider the adoption of measures that limit the scope of coverage and ensure that the estimated number of RRP events is more reflective of the goals and intents of the program. For example, EPA could limit the scope of housing stock covered by the regulation to homes built before 1960 which have a greater likelihood of containing lead-based paint. Furthermore, EPA could revisit the issue of an opt-out or other regulatory alternatives to ensure that the rule is effectively targeting the at risk population identified in the regulatory hazard finding avoiding application of the RRP program where lead-based paint hazards are not present.

The program as it is currently being implemented cannot efficiently target the underlying environmental and health goals it was established to meet. To address this deficiency EPA should act to narrow the targeted scope of the rule to cover those homes most likely to contain lead-based paint and those most likely to present an exposure risk to children under 6 or pregnant women. By effectively retargeting this program through an accurate economic analysis and a realistic evaluation of available tools and resources EPA will ensure that the RRP program moving forward works better for not only the certified renovators operating within the program but also for the clients and communities they serve.

Thank you for your consideration. NAHB staff and its members stand ready to work with EPA during the entirety of this stakeholder outreach process and welcome any opportunity to participate in individual follow-up meetings. As with any regulation, meaningful retrospective review of the program following implementation is key to identifying opportunities to improve the program, reduce unnecessary regulatory burdens and eliminate unintended consequences without undermining the effectiveness and integrity of the program or impeding the underlying environmental objective of the authorizing statute.

Please do not hesitate to contact me at (202) 266-8327 or tspielvogel@nahb.org if you have any questions or if you would like to discuss NAHB's comments further.

Sincerely,



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July 5, 2016

Gina McCarthy, Administrator
United States Environmental Protection Agency
1200 Pennsylvania Ave. N.W.
Washington, DC 20460

(Submitted electronically)

RE: Petition for Reconsideration on EPA's Final Rule: Lead-Based Paint Programs; Amendment to Jurisdiction-Specific Certification and Accreditation Requirements and Renovator Refresher Training Requirements

Dear Administrator McCarthy,

On February 17, 2016, the U.S. Environmental Protection Agency (EPA) promulgated "Lead-Based Paint Programs; Amendment to Jurisdiction-Specific Certification and Accreditation Requirements and Renovator Refresher Training Requirements" ("Recertification Rule"), 81 Fed. Reg. 7987 (Feb. 17, 2016). Despite proposing a straightforward approach to streamline the recertification requirements of the Lead; Renovation, Repair, and Painting program, EPA chose a far more complicated approach for which the agency neither solicited nor received public input. The agency's adoption of an entirely new system for recertifying certified renovators creates additional burdens, is contrary to the agency's goals, and fails to satisfy the Administrative Procedure Act (APA).

Pursuant to APA section 553(e) and the Toxic Substances Control Act (TSCA) section 21, NAHB respectfully petitions EPA to reconsider its adoption of the Recertification Rule, and to initiate a rulemaking to repeal those provisions for which the public was not provided adequate notice. The rule EPA finalized bears little resemblance to the rule it proposed, in both purpose and substance. The Recertification Rule contradicts the agency's stated purpose for revising the RRP Rule in the first place. As finalized the amended rule does not encourage remodelers to remain RRP certified, nor does it decrease their participation burden.

NAHB is a federation of more than 700 state and local home builder associations nationwide. The organization's membership includes over 140,000 firms engaged in land development, single and multifamily residential construction, remodeling, multifamily ownership and management, building material trades, building products manufacturing and supply, and commercial and light industrial construction projects. Over 95 percent of NAHB's members are classified as "small businesses," as defined by the U.S. Small Business Administration, and NAHB members collectively employ over 3.4 million people nationwide. Four out of every five new homes are built by NAHB members.

NAHB members are involved in the development, construction and remodeling of for-sale single family homes across the spectrum, including first-time and low- and moderate-income homebuyers. They also construct, own and manage multifamily rental housing, including affordable rental housing. Because of the nature of their businesses, NAHB's members and their activities are also subjected to numerous laws, regulations and policies issued and enforced at the federal, state and local levels.

I. Background

The Recertification Rule amends a regulation EPA first promulgated in 2008 – the Lead; Renovation, Repair, and Painting program rule ("RRP Rule"), which regulates the disturbance of lead-based paint during renovation activities. In this latest revision, EPA proposed removing the hands-on requirement for the Certified Renovator refresher training course. 80 Fed. Reg. 1873 (Jan. 14, 2015).

Contrary to the stated goals and observations enumerated in the proposed rule, however, the agency put forth a final rule that further complicated an already confusing schedule of requirements for certified renovators. To do so, EPA made two significant changes. First, EPA shortened the recertification period for certified renovators who take a course that does not have a hands-on component from five years to three years. Following this three-year period, the certified renovator who elects this option must take a recertification course with a hands-on component. Second, EPA established a separate path for renovators who elect to take a course with a hands-on component by providing them a recertification period of five years (instead of the three years for those taking a course that has no hand-on component).

Thus, EPA altered the recertification program by setting up two separate recertification schedules – three years/five years or every five years – based solely on the format of one element of the refresher course. Not only do these changes undermine the agency's intent to simplify the recertification process and reduce the burden on remodelers to become recertified, they were never proposed during the rulemaking process. As a result, affected parties had no opportunity to provide input or suggest alternatives that may be more workable in the field. It is for these reasons that NAHB requests that EPA reconsider the Recertification Rule, remedy the substantive and procedural failings of the Rule and move to enact new regulations that support the initial intent of the agency's proposal.

II. The Recertification Rule Is Problematic and EPA Needs to Reconsider the Rule

a. The Recertification Rule is Unnecessarily Burdensome and Complicated

Throughout the proposal, EPA reiterated its reasons for eliminating the hand-on training component. The agency cited its belief that it is "less important for the refresher course to include hands-on training" because of the less technical nature of the tasks being performed. 80 Fed. Reg. at 1875. EPA also recognized the importance of reducing time and expense burdens for the many certified renovators that must travel significant distances to attend training programs. *Id.*). Despite these intentions, the agency has fallen short. Unlike the proposal, the final rule is confusing and cumbersome. More importantly, because of these faults, it provides a

disincentive for renovators to remain in the program, perhaps jeopardizing the availability of sufficient certified renovators to perform regulated activities in certain geographic areas.

In both the proposal and the final rule, EPA states that "the proposed revisions are intended to improve the day-to-day function of these programs by reducing burdens to industry and the EPA and by clarifying language for training providers, while retaining the benefits of the original rules." Instead, the agency is further complicating an already confusing process and adding burdens that are neither wise nor warranted. Under the existing RRP program, certified renovators are already on a rolling schedule as to when they need to get recertified. The final rule increases the uncertainty, as it adds two tracks for recertification that must now be monitored and documented if renovators are to maintain their certifications, and the tracks themselves are on different time schedules. A standard path would have been much easier to follow for both renovators and EPA.

Similarly, EPA was keenly aware of the burdens associated with including a hands-on requirement as part of refresher training, particularly for renovators who live far from a training facility. To address these concerns, EPA not only proposed to eliminate the requirement, but also asked for comment on other ways to minimize the burdens associated with the hands-on training. Importantly, the agency also recognized the link between travel and cost burden associated with limited access to training in certain areas and realized that eliminating the hands-on training requirement for refresher courses would encourage more renovators to get recertified. EPA plainly stated that having more certified renovators would result in "a workforce better able to perform renovations in a lead-safe manner." 80 Fed. Reg. at 1875.

Indeed, EPA even concluded that the capabilities of certified contractors and the quality of their work would not be compromised by the proposal, stating that "Now that renovators will take the refresher course only after being initially certified in a way that includes hands-on training, EPA believes it is less important for the refresher course to include hands-on training. In addition, renovators that are seeking recertification have been practicing the hands-on skills on renovation jobs during their 5-year certification." 80 Fed. Reg. at 1875 In addition, EPA stated that in light of the less technical nature of the work practices taught in the renovator courses (as compared to courses regarding lead abatement), receiving hands-on training once is sufficient.

NAHB agrees and has long been an advocate of removing the hands-on component from the refresher course. NAHB submitted comments in support of EPA's proposal on February 13, 2015 "applaud[ing] EPA on its efforts to advance a common sense proposal…" and focusing primarily on the timing of the final rule's issuance to ensure that all certified renovators would have the opportunity to find a refresher course that best suits their needs.

Unfortunately, in the interim, EPA finalized a rule that abandoned many of the intended improvements and reinstated the burdens it sought to avoid. The recertification process has been made more cumbersome and difficult, effectively undermining the expectation that more renovators will take the refresher course and get recertified. As a result, fewer certified renovators will likely be able to capitalize on the anticipated savings or efficiencies associated

with accessing on-line only training to maintain their certification. EPA is strongly urged to modify the rule.

b. The Recertification Rule Does not Satisfy the Requirements of the Administrative Procedure Act

The APA requires agencies to include three specific elements in a notice of proposed rulemaking (NPRM). 5 U.S.C. §553(b). The NPRM must include 1) the time, place, and nature of the proceedings; 2) the legal authority under which the rule is proposed; and 3) "the terms or substance of the proposed rule or a description of the subjects and issues involved." *Id.* Agencies must also provide the public with "an opportunity to participate in the rule making through submission of written data, views, or arguments." 5 U.S.C. §553(c). Courts have interpreted these two provisions of the APA as requiring that a final rule constitute a "logical outgrowth" of the proposal. *See, e.g., CSX Transp., Inc. v. Surface Transp. Bd.,* 584 F.3d 1076, 1078 (D.C. Cir. 2009)(describing the agency's obligation under 5 U.S.C. §553(b)(3) to include in the notice the terms and substance of the proposal); *International Union, United Mine Workers of America v. Mine Safety and Health Admin.*, 407 F.3d 1250, 1259 (D.C. Cir. 2005) and *Environmental Integrity Project v. EPA,* 425 F.3d 992, 996 (D.C. Cir. 2005)(providing the rationale for the APA's notice requirements found at 5 U.S.C. §553(c)).

Agencies must provide adequate information in the proposal so that the public can offer comments and have an opportunity to contribute to the administrative record. As the D.C. Circuit stated in *CSX*, a "final rule qualifies as a logical outgrowth 'if interested parties 'should have anticipated' that the change was possible, and thus reasonably should have filed their comments on the subject during the notice-and-comment period. By contrast, a final rule fails the logical outgrowth test and thus violates the APA's notice requirement where 'interested parties would have had to 'divine [the agency's] unspoken thoughts,' because the final rule was surprisingly distant from the proposed rule.'" *CSX,* at 1079-80. (internal citations omitted)

EPA's actions in this rule fall into the latter category. Because EPA did not propose amendments to section 745.90, the renovator community had no notice that the agency might make revisions or finalize a rule changing the requirements to maintain certified renovator status, yet Section 745.90 is extensively revised in the final rule. In addition, the preamble gave no notice to the regulated community that the agency was contemplating a bifurcated recertification schedule for renovators based solely on the format of one element of the otherwise identical refresher training course.

Since EPA articulated a goal of encouraging renovators to get recertified in order to promote a "workforce better able to perform renovations in a lead-safe manner," and proposed steps to eliminate or at least minimize an "unnecessary" impediment to that goal and encourage recertification, the regulated community could not reasonably have anticipated that the agency would instead adopt an alternative that would create disincentives for renovators to forego hands-on training as part of a refresher course. In other words, given that the agency had actively sought to encourage recertification by offering ways to reduce the burdens associated with the hands-on component of refresher training, NAHB and its members did not contemplate that EPA would adopt a system that would offer benefits in a reduced form – through

mechanisms nowhere hinted at in the proposal – while sending the unmistakable signal that taking advantage of those benefits is disfavored by the Agency

Without notice of EPA's "unspoken thoughts," the regulated community was unable to meaningfully participate in the rulemaking process and to provide the agency with constructive feedback and data to support or dispute the agency's decision. For example, instead of submitting comments supporting EPA's proposal, NAHB would have written comments strongly opposing the agency's bifurcated approach. NAHB would have submitted comments highlighting the unneeded complexity EPA's actions have injected into the recertification process. NAHB would also have had an opportunity to notify its members – the individuals who must comply with these regulations – that a complex, bifurcated recertification process was headed their way. Without notice, and with an immediately-effective implementation date, NAHB has scrambled to try to assist its members in deciphering EPA's intent.

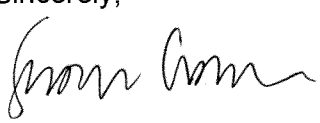
c. Because the Recertification Rule is not a Logical Outgrowth of the Proposal, it must be Repealed

EPA finalized a markedly different approach to the refresher training course than it had proposed, having provided NAHB and other stakeholders no notice of that divergent path. Courts have frequently found that vacatur is the appropriate remedy for an agency's failure to abide by the APA's notice requirements. *See, e.g., CSX* at 1082-83 (finding that where a failure to give adequate notice is "important and potentially prejudicial," vacatur is the appropriate remedy); *International Union, UMW* at 1261 (vacating and remanding a portion of the challenged regulation). NAHB has been similarly prejudiced by its inability to comment on EPA's revisions to section 745.90. Repeal of these portions of the Recertification Rule is appropriate in this case, and NAHB calls on EPA to quickly take this action.

Vacatur is appropriate, not simply to cure the procedural defect, but because the Recertification Rule does not accomplish the agency's stated goals for the revision. It complicates, rather than simplifies, the process for becoming recertified, and increases, rather than decreases the burden on certified renovators, who must now follow different timelines and processes based on the format of the refresher training course they attend.

NAHB calls on EPA to reconsider the Recertification Rule and remedy the substantive and procedural failings of the Rule detailed above. If you have any questions concerning this petition please contact Amy Chai (202-266-8232 or achai@nahb.org) or Tamra Spielvogel (202-266-8327 or tspielvogel@nahb.org).

Sincerely,



Susan Asmus
Senior Vice President

cc: Jim Jones, Assistant Administrator, Office of Chemical Safety and Pollution Prevention (OCSPP), U.S. Environmental Protection Agency
Tanya Mottley, Director, National Program Chemicals Division, OCSPP, U.S. Environmental Protection Agency
Michelle Price, Chief, Lead, Heavy Metals and Inorganics Branch, National Program Chemicals Division, OCSPP, U.S. Environmental Protection Agency
Howard Shelanski, Administrator, Office of Information and Regulatory Affairs, Office of Management and Budget, White House
Darryl L. DePriest, Chief Counsel for the Office of Advocacy, U.S. Small Business Administration

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

DEC - 8 2016

OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

Susan Asmus
Senior Vice President
National Association of Home Builders
1201 15th Street NW
Washington, DC 20005

Dear Ms. Asmus:

The U.S. Environmental Protection Agency has completed its review of your July 5, 2016 petition requesting that the EPA reconsider its final rule published on February 17, 2016, (81 Fed. Reg. 7987) to amend the renovator recertification requirements. The petition invoked the Administrative Procedure Act (APA) (5 U.S.C. § 553(e)) and section 21 of the Toxic Substances Control Act (TSCA).

Based on this review of your request, the EPA is denying the petition under section 553(e) of the APA. As stated in the August 5, 2016 letter to you from Wendy Cleland-Hamnett, Director of the Office of Pollution Prevention and Toxics, your request was not considered a petition under section 21 of TSCA because TSCA section 21 does not apply to TSCA Title IV – Lead Exposure Reduction (including sections 402(a) and 402(c)(3), pursuant to which the February 17 rule was promulgated).

In your petition, you contend that EPA failed the APA's logical outgrowth test by not providing adequate information in the proposed rule so that the public could offer comments and have an opportunity to contribute to the administrative record. You further state that the preamble gave no notice to the regulated community that the Agency was contemplating a bifurcated recertification schedule for renovators. Consequently, you believe the rule should be repealed. However, all the arguments that you raise in your petition regarding procedural issues are untimely. TSCA section 19(a)(1) specifies a jurisdictional window of 60 days for judicial review of a rule promulgated under TSCA Title IV, such as the February 17, 2016 final rule. EPA regulation further details when promulgation begins for a TSCA rule for purposes of judicial review under section 19(a)(1). 40 C.F.R. § 23.5. Here, for purposes of judicial review, promulgation occurred on March 2, 2016, two weeks after publication in the Federal Register. Thus, the window of 60 days for judicial review passed before your petition was received by EPA. All of NAHB's procedural arguments could have been asserted during the window for judicial review. NAHB had its opportunity to seek judicial review of the final rule at that time but did not do so. Accordingly, EPA declines to now consider your untimely procedural arguments.

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On the other concerns of your petition, however, you further state that the rule is unnecessarily burdensome and complicated, discouraging participation and jeopardizing sufficient coverage. You contend that the rule increases uncertainty because it adds two tracks to renovator recertification on different time schedules making the recertification process cumbersome and difficult. EPA respectfully disagrees with these concerns (and to the extent EPA addressed them in the final rule, EPA is not reconsidering its position or reopening those issues). EPA does not believe that the final rule is burdensome and confusing and, accordingly, does not foresee the negative consequences you assert. As EPA explained in the final rule itself, the final rule projected an *increased* number of participating renovators (81 Fed. Reg. 7987, 7992). Renovators can now take the refresher training without hands-on learning if they choose, giving them another option for recertification. Renovators are not required to take advantage of this option. They can take the training with hands-on learning if they prefer. Regardless of which type of training someone takes, the certificate issued by the training provider will state the date the course was completed and when the certification expires (40 C.F.R. § 745.225(c)(8)(iii) and (viii)), in either three or five years, making it easy for renovators to know when they need to be retrained and which refresher training they are eligible to take. Accordingly, given EPA's disagreement with the policy arguments asserted by NAHB, EPA denies your petition for amendment or rescission based on your policy concerns.

Thank you for your continued interest in the Agency's efforts to reduce lead exposures. If you have questions relating to your petition, contact Michelle Price of my staff at (202) 566-0744.

Sincerely,

James J. Jones
Assistant Administrator

National Association of Home Builders

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September 29, 2010

The Honorable Lisa P. Jackson
Office of the Administrator
Environmental Protection Agency
Ariel Rios Federal Building
1200 Pennsylvania Avenue, N.W.
Washington D.C. 20460

Re: Petition for Rulemaking concerning EPA's Lead; Renovation, Repair, and Painting Rule

Dear Administrator Jackson:

On behalf of the National Association of Home Builders (NAHB), I respectfully petition the U.S. Environmental Protection Agency (EPA), pursuant to the Administrative Procedure Act, to amend its Lead; Renovation, Repair, and Painting Rule (RRP Rule) to reflect the lack of an improved EPA-recognized test kit and the economic ramifications stemming from the unavailability of such a test kit.

NAHB is a Washington, D.C.-based trade association representing more than 175,000 members involved in home building, remodeling, multifamily construction, property management, subcontracting, design, housing finance, building product manufacturing and other aspects of residential and light commercial construction. Known as "the voice of the housing industry," NAHB is affiliated with more than 700 state and local home builder associations (HBAs) around the country. NAHB's builder members will construct about 80 percent of the new housing units projected for 2010.

Approximately half of our builder members acknowledge that home renovation is a part of their business model. More than 14,000 firms belong to NAHB Remodelers and comprise about one-fifth of all firms that specify remodeling as a primary or secondary activity. NAHB's membership also includes nearly 1,000 multi-family construction firms and property

management companies. These NAHB members, along with renovation consumers living in homes built before 1978, are significantly impacted by the absence of an improved test kit. Without an affordable means to determine whether a property contains regulated amounts of lead-based paint, millions of properties that have no lead-based paint hazard will be subject to costly lead-safe work practices.

Introduction

The RRP Rule mandates that all "for hire" contractors performing renovation work in properties that meet either the statutory definition of "target housing" or EPA's regulatory definition of "child-occupied facilities" must comply with its requirements.[1] The RRP Rule provides two exemptions from its applicability provisions. The first exemption is available where a risk assessor or lead inspector has certified that the building components to be disturbed during the renovation are free of lead-based paint (LBP).[2] The second exemption applies where a certified renovator using an EPA-recognized test kit has tested the relevant building components for lead-based paint prior to beginning the renovation and achieves a negative result.[3]

In the RRP Rule, EPA described the process by which it would recognize the test kits that certified renovators may use to take advantage of the second exemption. Recognizing the need to improve upon the existing test kits, EPA also instituted a phased approach in determining which test kit would be used. The final rule allows renovators to use existing test kits satisfying only the "negative response criteria," i.e., a false-negative rate of 5%, until September 1, 2010. After September 1, 2010, only improved test kits that satisfy both negative and positive response criteria i.e., a false negative rate of 5% and a false positive rate of 10%, can be used by certified renovators to qualify for the second exemption.[4]

Contrary to this requirement, on July 27, 2010, EPA announced on its website that no EPA-recognized test kit fully satisfying section 745.88(c) would be available by September 1, 2010. Furthermore, EPA's announcement stated it expected the current EPA-recognized test kits to remain in use until the Agency publicizes, at a date uncertain, that an improved EPA-recognized test kit is

[1] 15 U.S.C.A. § 2681(17); 40 C.F.R. § 745.83.
[2] 40 C.F.R. § 745.82(a)(1), 40 C.F.R. § 745.226.
[3] 40 C.F.R. §745.82(a)(2).
[4] 40 C.F.R. § 745.88(c).

capable of achieving the positive and negative response criteria required under the EPA rule.[5]

The RRP Rule very clearly states that after September 1, 2010, all EPA-recognized test kits capable of detecting the presence of LBP at regulated levels must achieve a certain level of accuracy for both negative and positive response criteria. To date, such test kits do not exist. Likewise, the agency has taken no action to remove the September 1, 2010 deadline or to clarify that the EPA-recognized test kits that are currently available and satisfy only the negative response criteria may be used after September 1. As a result, compliance is unclear and the existing rule is very different from the one envisioned when it was finalized in 2008, analyzed in the Economic Analysis (EA), and approved by the Office of Management and Budget (OMB). Indeed, NAHB believes that if the true costs of the RRP Rule were considered (recognizing an EPA-recognized test kit for both variables does not exist), the agency would not have finalized the rule as it exists today.

NAHB therefore respectfully petitions EPA to use its authority under 5 U.S.C. section 553(e) to initiate a rulemaking to address the confusion regarding the requirements for EPA-recognized test kits after September 1, 2010. Furthermore, given the crucial role EPA-recognized test kits play under the RRP Rule by reducing overall compliance costs by focusing on those properties that do in fact contain LBP, EPA is urged to revise the various economic analyses used to support the rule and consider finalizing an amended rule that reduces the overall economic burden on property owners and contractors. At a minimum, EPA should honor the pledge it provided in the preamble to the RRP, published April 22, 2008, which stated, "[i]f the improved test kits are not commercially available by September 2010, EPA will initiate a rulemaking to extend the effective date of this final rule for 1 year with respect to owner-occupied target housing built after 1960."[6] The rationale for these actions is explained below.

1. The Unavailability of an EPA-Recognized Test Kit Requires Immediate Changes to the RRP Rule.

The RRP Rule maintains an exception for renovations conducted in pre-1978 housing where a certified renovator uses an "EPA-recognized test kit" to determine that the components that will be impacted by the renovation are free of

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[5] U.S. Environmental Protection Agency, *EPA Recognition of Lead Test Kits*, EPA's website: http://www.epa.gov/lead/pubs/testkit.htm#recognized, last visited on September 2, 2010

[6] *Lead; Renovation, Repair, and Painting Program; Final Rule,* 73 Fed. Reg. 21713 (Apr: 22, 2008).

lead paint at or in excess of the regulated level (1.0 milligrams per square centimeter or 0.5% by weight).[7] A recognized test is defined as "a commercially available test kit recognized by EPA under section 745.88 as being capable of allowing a user to determine the presence of lead at levels equal to or in excess of 1.0 milligrams per square centimeter, or more than 0.5% lead by weight, in a paint chip, paint powder, or painted surface."[8]

Section 745.88 describes the process by which EPA will recognize test kits, including the evaluation criteria to be used. The rule establishes two evaluation criteria for test kits, termed "negative" and "positive." The negative response criteria requires a demonstrated probability, with 95% confidence, of a negative response less than or equal to 5% of the time.[9] In order to satisfy the "positive" criteria, there must be a demonstrated probability, with 95% confidence, of a positive response less than or equal to 10% of the time.[10] In other words, the fully compliant test kit envisioned by EPA would give a false positive reading (e.g., incorrectly indicating the presence of LBP at federally regulated levels) no more than 10% of the time, and would give a false negative reading (e.g., incorrectly indicating that LBP is not present at federally regulated levels when, in fact, it is), no more than 5% of the time.

In response to the 2008 RRP, EPA designated test kits that satisfied the negative criteria only as EPA-recognized beginning June 23, 2008.[11] Section 745.88(a) explained, "[t]his recognition will last until EPA publicizes its recognition of the first test kit that meets both the negative response and positive response criteria."[12] Additionally, section 745.88(b) describes the process and timeline by which new test kits would be considered and states, "starting September 1, 2008, EPA would initiate the screening process using the "Environmental Technology Verification" program."[13] Section 745.88(b)(3) then establishes a clear delineation between the use of negative criteria only and negative and positive criteria test kits, as it reads,

> "Before September 1, 2010, test kits must meet only the negative response criteria in paragraph (c)(1) of this section. The recognition of kits that meet only this criteria [*sic*] will last until EPA publicizes its recognition of the first test kits

[7] 40 CFR § 745.22(a)(2).
[8] 40 CFR § 745.83.
[9] 40 CFR §745.88(c)(1).
[10] 40 CFR § 745.88(c)(2).
[11] 40 CFR §745.88(a).
[12] *Id.*
[13] 40 CFR §745.88(b)(1)-(2).

> that meets [*sic*] both of the criteria in paragraph (c) of this section."[14]

The language above is identical to the language at section 745.88(a). However, section 745.88(b) does not stop here. Instead, it goes on to state: "After September 1, 2010, test kits must meet ***both*** of the criteria in paragraph (c) of this section."[15] (emphasis added)

On July 27, 2010, EPA announced its preliminary conclusion that no test kits meet both criteria required in paragraph (c), and that no test kit is expected to meet both criteria in the foreseeable future.[16] EPA further states that it will "continue to recognize" the two tests currently recognized as satisfying the negative criteria, and NAHB learned from EPA staff that the agency does not intend to amend the RRP Rule to remove the September requirement. NAHB disagrees with this approach. The regulation clearly imposes a September 1, 2010 deadline for all EPA-recognized test kits under the RRP Rule to achieve both the positive and negative response criteria required under section 745.88(c).

EPA has interpreted the RRP Rule to permit the agency to continue to recognize the negative-criteria only test kits after September 1, 2010, solely on the basis of section 745.88(b)(3).[17] This interpretation ignores entirely the express prohibition against the use of these test kits after September 1, 2010, which appears in the subsequent section, 745.88(b)(4). While EPA's discretion to interpret its regulations is broad, it is not absolute. Courts have consistently held that an agency's interpretation is given substantial deference "unless it is plainly erroneous or inconsistent with the regulation."[18] Moreover, where the regulation is unambiguous, the agency is not afforded this deference.[19] Here, the regulation clearly states, "After September 1, 2010, test kits must meet both of the criteria in paragraph (c) of this section." Thus, the agency's interpretation that the second sentence in section 745.88(b)(3) permits it to continue to

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[14] 40 CFR §745.88(b)(3).
[15] 40 CFR §745.88(b)(4).
[16] EPA, http://www.epa.gov/lead/pubs/testkit.htm (last visited August 30, 2010).
[17] *See id; see also* conversation with EPA staff August 25, 2010. However, EPA has to date issued no written interpretation of section 745.88 to support its recognition of the negative response criteria-only test kits after September 1, 2010.
[18] *Thomas Jefferson University v. Shalala,* 512 U.S. 504, 512, 114 S. Ct. 2381, 2386 (1994).
[19] *Id.* (holding that the agency interpretation is granted deference "unless an alternative reading is compelled by the regulation's plain language" (internal citations omitted); *see also Exportal LTDA v. United States,* 902 F.2d 45, 50 (D.C. Cir. 1990)(" it is equally well established that this deference is due *only* when the plain meaning of the rule itself is doubtful or ambiguous.... Deference to agency interpretations is not in order if the rule's meaning is clear on its face.)(internal citations omitted).

recognize the existing test kits after September 1, 2010, should not be afforded deference.

While NAHB is relieved that its members may continue to use the test kits satisfying only the negative criteria, EPA is compelled to amend the RRP Rule to reflect the lack of an improved test kit covering both positive and negative criteria. Moreover, it needs to clarify for the regulated community that existing test kits satisfying only the negative criteria may be used after September 1, 2010. Failure to do so could result in further confusion in the regulated and training community as well as needlessly increasing remodeling costs for consumers who own properties that do not contain lead-based paint.

2. The Lack of an Improved Test Kit Compels a New Economic Analysis and a New Rule

EPA predicated the RRP Rule on the existence of an improved test kit that would reduce the overall costs associated with the Rule by identifying and exempting certain homes and activities that do not contain LBP from the rule's lead-safe work practices (LSWPs). Because an improved test kit does not exist and is not anticipated within the foreseeable future, EPA must revise its economic analysis and final rule to appropriately reflect the lack of an improved test kit.

The *2008 Economic Analysis* prepared for the final 2008 RRP Rule prominently discussed the role that an improved EPA-recognized test kit played in determining the costs of the regulation.[20] Not only did EPA envision a low-cost test kit, but also the kit was expected to identify those renovation projects that do not contain LBP and are therefore exempt from the RRP Rule. The test kits would save hundreds of millions of dollars annually that would otherwise be spent on unnecessary protective measures. According to the Economic Analyses prepared for both the final RRP Rule and later amendments, EPA stated the recognized test kits would satisfy three critical elements: be economical (less than $0.50 per test); provide fast results that would allow certified contractors to proceed with their renovation work without significant delay; and be reliable.[21] Reliability is defined in the RRP as meeting both the false positive and false negative criteria specified in section 745.88(c). Because

[20] *See, e.g.,* U.S. Environmental Protection Agency (EPA), *Economic Analysis for the TSCA Lead Renovation, Repair, and Painting Program Final Rule for Target Housing and Child-Occupied Facilities* ES-4 ("2008 Economic Analysis") ("As a result of the improved test kits, the number of events with lead-safe work practices under Option F [Final Rule] drops from 8.4 million to 4.4 million in the second year.").
[21] EPA, *2008 Economic Analysis*, Chapter 4, page 57.

the existing test kits do not satisfy EPA's reliability criteria, the analyses are flawed and must be redone.

In 2003, OMB issued guidance to the federal agencies on how to perform the regulatory analysis required under Executive Order (EO) 12866. That guidance directs all federal agencies to anticipate and evaluate the likely consequences of rules and identify the key effects of the various regulatory alternatives considered by the agency when developing the proposed regulation. The overall goal of this regulatory analysis is twofold: 1) to determine if the benefits of the proposed action are likely to justify the costs; and 2) to identify which of the possible regulatory alternatives would be the most cost effective.[22] By basing its economic analysis on the existence of a test kit that EPA now admits does not exist, the Agency cannot justify the final rule in its current form. To rectify this shortcoming, EPA must revisit the economic analysis and, as required under E.O. 12866, consider other regulatory options to reduce the overall cost of the RRP Rule.

In determining the scope of the 2008 RRP Rule, EPA estimated that in the first year of implementing the rule, there would be 8.4 million "LSWP events," or renovation events that would require the use of LSWPs. The economic analysis assumed that in the first year, test kits would have false positive rates of 63% (the midpoint between the range of false positives from 47-78%), and that an "improved test kit" would have a 10% false positive rate as required by the regulation.[23] The analysis stated that while "EPA is confident that improved test kits can be commercially available by September 2010," it nonetheless assumed that the improved test kits would not be available until the second year the rule is in effect.[24] Beginning in the second year, EPA estimated that the number of LSWP events would decrease to 4.4 million due to the existence of an improved test kit.[25] Thus, an improved test kit effectively reduces the number of LSWP events by nearly one half. Conversely, however, the lack of a reliable test kit keeps the number of projects that must use LSWPs at 8.4 million.

When EPA amended the RRP Rule in April 2010 to remove the opt-out provision, it also developed an economic analysis of that amendment (*2010 Economic Analysis*). Again, the agency relied explicitly on the existence of an "improved" test kit satisfying both the positive and negative criteria found in the

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[22] Office of Management and Budget, *Circular A-4*, September 13, 2003.
[23] *2008 Economic Analysis* at 4-19.
[24] *Id.*
[25] *Id* at ES-4.

RRP.[26] As a result, EPA estimated that removing the opt-out provision would add 5.4 million LSWP events in the first year of the regulation and 3.0 million in subsequent years – again due solely to the existence of an improved test kit.[27] Taken together to reflect the current regulatory regime (8.4 million with the opt-out plus 5.4 after its removal), EPA has estimated that without the test kits, a total of 13.8 million renovation events will require the use of LSWPs. With improved test kits, this number would drop to 7.4 million – a decrease of more than 46%.

As one would expect, with a decrease in the number of LSWP events comes a decrease in lead-safe work practice compliance costs. In the 2008 Economic Analysis, EPA estimated LSWP costs in the first year to be $490.7 million.[28] In the third year, which represents full implementation of the LRRP Rule along with the existence of a commercially available improved test kit, the total work practices cost is estimated to be $301.2 million with a 3% discount rate and $279.1 million with a 7% discount rate.[29] The 2010 Economic Analysis similarly estimates the additional work practice costs incurred with the removal of the opt-out provision at $336 million in the first year,[30] and $209 million with a 3% discount rate and $194 million with a 7% discount rate in the third year, which represents the first year of full compliance with all aspects of the regulation.[31] Adding these figures together to reflect the current regulatory regime, the total lead-safe work practices costs associated with the negative-criteria only test kit are estimated to be $826.7 million in the first year. With an improved test kit, the estimated work practice costs decrease to $510.2 million with a 3% discount rate and $473.1 million with a 7% discount rate.

However, contrary to EPA's estimates, which included decreased numbers of LSWP events in subsequent years due to the existence of a qualified test kit, because that kit does not exist, there will be no decrease in compliance costs because there will be no decrease in the number of LSWP events. Employing the same formula EPA used to determine discounted costs, NAHB

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[26] U.S. Environmental Protection Agency, *Economic Analysis for the TSCA Lead Renovation, Repair, and Painting Program Opt-Out and Recordkeeping Final Rule for Target Housing and Child-Occupied Facilities ES-4*, ("2010 Economic Analysis"), ("EPA is working on the development of test kits that accurately identify both the presence and absence of lead in paint at levels that exceed the Federal standards. This analysis assumes that improved test kits will be in use starting in June 2011. Thus, the number of events with lead safe work practices is estimated to decrease from the first year to the second year because of the adoption of the improved test kits.").
[27] *Id.* at ES-4, Table ES-3.
[28] EPA, *2008 Economic Analysis* at 4-133, Table 4-111.
[29] *Id.* at 4-136-137, Tables 4-114 to 4-115.
[30] EPA, *2010 Economic Analysis* at 4-83, Table 4-66.
[31] *Id.* at 4-84, Table 4-68.

calculates that the subsequent year costs become $779.2 million with a 3% discount and $722.1 million with a 7% discount – an additional cost of $250-270 million each year due to the absence of an improved test kit.

EPA relied so substantially on the existence of the test kit that its absence renders the economic analysis inaccurate. At a minimum, EPA should revise its economic analyses to reflect that there will be no difference between Year 1 and all subsequent years of the rule. EPA must also reflect the higher costs and delays associated with traditional LBP testing. EPA must then revisit the regulatory options to ensure it has chosen the most cost effective one.

3. Application of the RRP Rule to Homes Built After 1960 Should Be Delayed

EPA recognized that the likelihood of a home built between 1960 and 1978 containing lead-based paint was low and that existing test kits would unnecessarily test positive for lead in many of those homes. So much so, that it originally proposed in 2006 that the rule only apply to pre-1960 homes for the first effective year of the rule.[32] The reason for delaying the use of the RRP Rule in 1960-1978 properties was the lack of a more reliable improved test kit.[33]

In the preamble to the final RRP Rule, EPA described the circumstances surrounding its approval of the use of test kits in determining the presence of lead-based paint. According to EPA, in homes built between 1960 and 1978, approximately 24% have lead-based paint, as compared to 87% of the housing built before 1940.[34] Thus, without an improved EPA-recognized test kit, contractors presuming the presence of lead and employing lead safe work practices in homes built before 1940 will be correct 87% of the time. However, using the same presumption for homes built between 1960 and 1978 will result in the application of lead-safe work practices (and their added expense) where no lead is present 76% of the time.[35]

EPA originally proposed to implement the RRP in phases. Under its 2006 proposal, homes built before 1960 would be subject to the rule's requirements upon the rule's effective date, while work performed on homes built between 1960 and 1978 would have to meet the requirements one year later. Ultimately, EPA decided not to employ a phased-in approach in the final rule because it had

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[32] *Lead; Renovation, Repair, and Painting Program; Proposed Rule*, 71 Fed. Reg. 1588, 1628 (Jan. 10, 2006).
[33] *Id.,* at 1599.
[34] 73 Fed. Reg. 21712 (Apr. 22, 2008).
[35] 71 Fed. Reg. 1599 (Jan. 10, 2006).

received assurances from "potential test kit manufacturers" that a commercially available test kit satisfying both negative and positive criteria could be "accomplished in the near future."[36] Therefore, "[a]fter reviewing the comments and weighing all of the factors, ***including EPA's expectation that the improved test kits will be commercially available by September 2010***, EPA has decided not to include a phased implementation in this rulemaking."[37] (emphasis added)

However, recognizing the significant role the test kits would play in ensuring the feasibility and affordability of the RRP Rule, EPA qualified its decision, stating:

> "Nonetheless, if the improved test kits are not commercially available by September 2010, ***EPA will initiate a rulemaking*** to extend the effective date of this final rule for 1 year with respect to owner-occupied target housing built after 1960."[38] (emphasis added)

In 2008, EPA clearly envisioned a world in which improved test kits would be available by 2010. That expectation has not come to fruition. As a result, EPA's current RRP Rule will place onerous mandates on millions of renovation activities in homes that do not contain LBP in regulated levels. Because EPA's own data shows the presence of LBP is highly unlikely within these homes,[39] coupled with the significant economic impacts the RRP will impose, NAHB urges EPA to delay the RRP for homes built between 1960 and 1978 until the Agency recognizes a test kit capable of achieving the accuracy levels outlined in section 745.88(c). At a minimum EPA should delay the Rule's effective date for this subset of homes until April 2011, as it said it would in the preamble.

4. If an Improved Test Kit is not Available in the Foreseeable Future, EPA Should Consider Alternative Means to Achieve the Same Regulatory Objective.

EPA has developed and implemented the RRP Rule based in large part around the anticipated existence of a test kit with a 5% false negative and 10% false positive response. Indeed, EPA estimated that the economic impact of the RRP Rule would be reduced substantially once such an improved test kit was available. EPA was even able to forego other implementation options, such as a

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[36] 73 Fed. Reg. 21712 (April 22, 2008).
[37] *Id.*
[38] 73 Fed. Reg. 21713 (Apr. 22, 2008).
[39] EPA, *2008 Economic Analysis, at*, Chapter 4, page 19.

phased-in approach based on the age of the home, because the Agency believed that an improved test kit would soon be on the market, bringing down compliance costs in short order.

Now that it is clear that an improved test kit will not be available for the foreseeable future, EPA is urged under this petition to consider alternative regulatory options to bring the compliance costs back in alignment with original estimates. For example, when EPA was developing the 2008 RRP Rule it examined various policy options that were designed to reduce the overall economic burden on property owners and contractors. EPA's considerations included a phased-in approach based on the age of the home and the "opt-out" provision that was initially a part of the final RRP, but was rescinded shortly.

The Opt-Out allowed homeowners without children under six or pregnant women in residence the choice when hiring a remodeler to authorize their remodeler to not perform the lead-safe work practices. Under this system, the eligible consumers, after being provided the pamphlet *Renovate Right: Important Lead Hazard Information for Families, Child Care Facilities, and Schools*, were given the opportunity to choose for themselves whether to require the contractor to adhere to lead-safe work practices during the renovation. As discussed above, EPA estimated in its 2010 Economic Analysis that removing the Opt-Out would add 5.4 million LSWP renovation events in the first year to the 8.4 million LSWP events calculated for the 2008 RRP, for a total of 13.8 million LSWP renovation events. If EPA were to reinstate the Opt-Out, the number of LSWP events would decrease by approximately 40% – a reduction that approximates what would have been saved if an improved test kit were available.

NAHB strongly urges EPA to examine the breadth of options available to reduce the costs and burdens associated with the RRP Rule. At a minimum, NAHB urges EPA to reinstate the Opt-Out provision for homes built after 1960, where only 24% of homes contain lead-based paint. Under this scenario, compliance costs would be decreased, and the use of LSWPs would be focused on those homes with a higher probability of the presence of lead-based paint.

Conclusion

NAHB, like many stakeholders, is disappointed that an improved test kit is not currently available, and is hopeful that the technology is developed soon. Nevertheless, without an improved test kit, and in light of other recent amendments EPA has made or proposed to the RRP, the RRP is becoming

substantially more expensive and complex than ever envisioned.[40] Through this petition, NAHB requests that EPA:

1. Propose an amendment to the RRP to clarify that existing test kits may be used after September 1, 2010;
2. Revise the economic analysis and reconvene with OMB to ensure the costs of the rule are in line with the expected benefits and that the final rule is the most cost-effective alternative;
3. Delay the effective date of the RRP Rule for post-1960 homes until an improved test kit is recognized; and
4. Consider alternative regulatory options in order to reinstate the cost savings that would have resulted with the existence of a commercially available, improved test kit.

If you have any questions regarding NAHB's petition, please do not hesitate to contact me or Amy Chai, Senior Counsel, Legal Affairs, at (202) 266-8232 or achai@nahb.org.

Sincerely,

Susan Asmus
Senior Vice President

CC:

Steve Owens, Assistant Administrator, EPA Chemical Substances and Pollution Prevention
Maria J. Doa, Ph.D., Director, EPA National Programs Chemicals Division
Cass Sunstein, Administrator, Office of Information and Regulatory Affairs
Karen G. Mills, Administrator, U.S. Small Business Administration

[40] *See* Lead; Amendment to the Opt-Out and Recordkeeping Provisions in the Renovation, Repair, and Painting Program, 75 Fed. Reg. 24802 (May 6, 2010); *see also* Lead; Clearance and Clearance Testing Requirements for the Renovation, Repair, and Painting Program, 75 Fed. Reg. 25038 (proposed May 6, 2010).

To: Spielvogel, Tamra[TSpielvogel@nahb.org]
Cc: Chai, Amy[achai@nahb.org]; Inge, Carolyn[Inge.Carolyn@epa.gov]
From: Dravis, Samantha
Sent: Wed 4/26/2017 6:12:07 PM
Subject: RE: NAHB Follow-up Information on RRP Program

Tamra, we definitely ought to meet soon. Carolyn: Please reach out to Tamra and get something on my schedule. Thank you!

From: Spielvogel, Tamra [mailto:TSpielvogel@nahb.org]
Sent: Wednesday, April 26, 2017 1:15 PM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Chai, Amy <achai@nahb.org>
Subject: RE: NAHB Follow-up Information on RRP Program

Samantha,

I wanted to follow up on our emails from earlier this month. While I know it has been a busy few weeks for all with both Easter/Passover holidays and a full agenda on the policy front we would still be interested in setting up a follow-up conversation to discuss this issue with you further. In fact, we will actually have a remodeler member coming to town this Monday to participate in the afternoon meeting the Office of Pollution Prevention and Toxics (OPPT) is having on "Regulatory Reform Agenda for Lead Exposure Reduction." If you had time available to meet after that event ends at 2:30p it would be beneficial to be able to provide you a practitioner's point of view on the program.

Thank You,

Tamra

TAMRA SPIELVOGEL Program Manager, Environmental Policy

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d: 202.266.8327 **e:** tspielvogel@nahb.org **w:** nahb.org

From: Dravis, Samantha [mailto:dravis.samantha@epa.gov]

Sent: Monday, April 03, 2017 1:55 PM
To: Spielvogel, Tamra <TSpielvogel@nahb.org>
Cc: Chai, Amy <achai@nahb.org>
Subject: RE: NAHB Follow-up Information on RRP Program

Thanks for all this, Tamra. Give me a chance to digest and then let's set a follow up call.

Best,

Samantha

From: Spielvogel, Tamra [mailto:TSpielvogel@nahb.org]
Sent: Monday, April 3, 2017 1:29 PM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Chai, Amy <achai@nahb.org>
Subject: NAHB Follow-up Information on RRP Program

Dear Ms. Dravis,

I'm emailing in follow-up to your conversation with Michael Mittelholzer at the NAHB meeting with Administrator Pruitt last week. I know several issues were discussed for additional follow-up during the meeting with the Administrator including the Renovation, Repair and Painting (RRP) Program and stormwater issues which my colleague Eva will be following up with you on in a subsequent message.

Attached is the material you and Michael discussed to provide additional detail regarding NAHB's concerns regarding implementation and evaluation of the RRP program. Specifically I have provided copies of NAHB's comments related to the Section 610 review as well as those NAHB submitted during both public comment periods EPA opened during the review of issues related to the lack of an approved lead test kit. Also, for your information I am including copies of two petitions NAHB has filed with EPA on the RRP program. The most recent was in regards to the changes made to the refresher training course requirements which was denied by the agency in December 2016. The EPA response is also enclosed. I have enclosed the 2010 petition because while the other documents discuss the issues we have with the economic analysis of the

rule, it was most comprehensively addressed in this petition on the test kit.

Finally, I was also told you are interested in the report where EPA's cost benefit estimates were called into question. The report was issued by the EPA Office of the Inspector General. The following link will take you to the OIG page for the report where you can access their findings, the report, as well as the responses exchanged between OIG and EPA on the report.

•□□□□□□□□ https://www.epa.gov/office-inspector-general/report-review-hotline-complaint-concerning-cost-and-benefit-estimates-epas

I would note that one of the commitments made by the EPA to the OIG was to collect better data but they made the commitment to do so in the context of a separate rulemaking (the development of an RRP rule for Public & Commercial Buildings) and that survey is currently underway. NAHB individually and as part of an industry coalition has called into question the efficacy of this effort. While the data may be useful to the residential program collecting it in the context of the Public & Commercial Buildings rule has never seemed appropriate or truly illustrative given a range of other differences between the two rules. Furthermore, the data is being collected prior to establishing a hazard for Public & Commercial Buildings.

NAHB looks forward to continuing the dialogue with EPA on this program and we would appreciate the opportunity to set up a meeting with you and your team to discuss these issues further. Please feel free to contact me at 202-266-8327 or tspielvogel@nahb.org.

Regards,

Tamra Spielvogel

TAMRA SPIELVOGEL Program Manager, Environmental Policy
National Association of Home Builders
1201 15th Street, NW | Washington, DC 20005
d: 202.266.8327 **e:** tspielvogel@nahb.org **w:** nahb.org
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To: Kelly, Kerry[KKelly5@wm.com]
Cc: Kime, Robin[Kime.Robin@epa.gov]
From: Dravis, Samantha
Sent: Sun 3/26/2017 1:20:21 PM
Subject: Re: Clean Air Act Rules for MSW Landfills

Thank you so much, Kerry. Look forward to following up soon.

Sent from my iPhone

On Mar 24, 2017, at 4:57 PM, Kelly, Kerry <KKelly5@wm.com> wrote:

Dear Samantha and Robin:

I meant to copy you on this email I just sent to George and pressed send too quickly. The attached materials are a follow-up to a conference call the Landfill Sector had with him this Tuesday to discuss recently promulgated Clean Air Act rules. He mentioned his intent to brief you on all of this, but I wanted to keep you in the loop with all our correspondence. If you have any questions, please do not hesitate to call.

I hope we will have the opportunity to meet soon.

Warm regards,

Kerry

Carter Lee "Kerry" Kelly

Senior Director, Federal Affairs

Kkelly5@wm.com

WM Waste Management

701 Pennsylvania Ave., NW, Ste 590

Washington, DC 20004

202.639.1218 office

571.377.9202 cell

From: Kelly, Kerry
Sent: Friday, March 24, 2017 3:10 PM
To: Sugiyama, George <sugiyama.george@epa.gov>
Cc: Kelly, Kerry <KKelly5@wm.com>
Subject: Clean Air Act Rules for MSW Landfills

Dear George,

We appreciated the opportunity to talk with you about our concerns with the revised New Source Performance Standards (new Subpart XXX) and Emission Guidelines (new Subpart Cf) for MSW Landfills, promulgated at the end of the Obama Administration as part of its Climate Action Plan. Although EPA determined that the "best system of emissions reduction" remained unchanged, the Agency significantly lowered the regulatory threshold at which controls must be installed for both new and existing sources based solely on estimated GHG benefits premised on the "Social Costs of Methane and Carbon." We believe these rules offer an ideal opportunity for EPA to meet President Trump's directives to reduce regulatory costs through needed rule revisions, and the potential to eliminate two regulations that could serve as an offset for any other EPA regulation.

The attached document summarizes our concerns and our recommendation for an immediate administrative stay of the rules pursuant to CAA Section 307. We believe that this important interim step is the easiest way for the Agency to begin a reconsideration or rulemaking process to correct the rules' deficiencies, while also allowing the states to halt expending precious resources on developing implementation plans. It will also give the Agency time to consider and grant an administrative stay under APA Section 705, while completing a remedial rulemaking process.

We believe time is of the essence. Already we are facing potential compliance risks associated with surprising regulatory interpretations of new Subpart XXX emerging from the Regions that are not based on regulatory text. We hope the attached will provide you with the information you need to set up a meeting with Samantha Dravis, but please do not

hesitate to call if we can provide additional explanations. I will call you to follow up on this email.

Warm regards,

Kerry

Carter Lee "Kerry" Kelly

Senior Director, Federal Affairs

Kkelly5@wm.com

WM Waste Management

701 Pennsylvania Ave., NW, Ste 590

Washington, DC 20004

202.639.1218 office

571.377.9202 cell

Recycling is a good thing. Please recycle any printed emails.

<Landfill Air Rules Summary.docx>

To: Dravis, Samantha[dravis.samantha@epa.gov]
Cc: dhedke@hs-geo.com[dhedke@hs-geo.com]
From: dhedke@cox.net
Sent: Thur 5/4/2017 6:11:16 PM
Subject: Fwd: Open letter to Ivanka Trump from Joseph Bast

Dear Samantha,

I hope this finds you well and enjoying your expanding endeavors at EPA.

In the event you have not seen the article below, appearing in today's American Spectator, I encourage you to take a look at your earliest convenience.

In addition, I humbly suggest that if he is not already doing so, the names that Administrator Pruitt really needs to listen to regarding anything related to Climate issues are people like:

Dr. Willie Soon, Astrophysicist at the Harvard-Smithsonian Center for Astrophysics;
Dr. Richard Lindzen, Physicist, Massachusetts Institute of Technology;
Dr. Will Happer, Physicist, Princeton University;
Dr. John Christy, Alabama State Climatologist, Director of the Earth Science Systems Center (ESSC), University of Alabama-Huntsville; Dr. Roy Spencer, former NASA lead scientist regarding implementation of weather satellite systems, now also at ESSC;
Dr. Patrick Michaels, former Virginia State Climatologist and Professor of Environmental Science at the University of Virginia, my second alma mater, currently at the Cato Institute;
J. Dr. Christopher Horner, Attorney, Competitive Enterprise Institute

These men are absolutely stalwarts in advancing fundamental understanding of earth's climate, as well as superb contributors regarding the advancement of appropriate policy related to U.S. and global matters of Environmental Stewardship. I could list many more, but this short list has been invaluable to me for many years.

Thank you and I hope this adds to your perspective related to moving our policy where it desperately needs to go.

Sincerely,

Dennis Hedke
Consulting Geophysicist
Past Chairman, Energy & Environment Committee, Kansas House of Representatives
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==========
From: Joseph Bast <JBast@heartland.org>
Subject: Open letter to Ivanka Trump from Joseph Bast
Date: Thu, 4 May 2017 16:47:52 +0000

American Spectator ran my “open letter to Ivanka Trump” on climate change today. The comments are pretty funny, too.

Joe

https://spectator.org/296756-2/

From the Heartland
Open Letter to Ivanka Trump: Serve Your Father by Relying on Scientists,
Not Celebrities Who Push Climate Calamity
By Joseph L. Bast<https://spectator.org/bio/joseph-l-bast/>
NOTE: The following is a letter Heartland Institute President Joseph Bast sent to Ivanka Trump, top advisor to president Donald Trump. As of today, he has received no response.
Dear Ms. Trump,
Recent news stories report your interest in the climate change issue. I share your deep concern over the future of our planet — it's an unbelievably beautiful and precious thing, something we must cherish and protect for all of Earth's creatures and for future generations.
I am writing to urge you to proceed carefully as you explore this subject, because those who claim climate change requires "immediate action" to reduce greenhouse gas emissions, or even "transforming the world's economic system," have often misrepresented the science and economics of this issue.
My organization, The Heartland Institute<http://heartland.org/>, is a national nonprofit organization that has been making the case for conservative and libertarian ideas since its founding in 1984. Many members of the Trump transition team are familiar with our work on climate change and other topics.
The Heartland Institute is "the world's most prominent think tank supporting skepticism of man-made climate change" (according to The Economist). We have published more books, policy studies, and commentaries on the topic than any other free-market think tank in the world (according to the scientific journal Global Environmental Change). We are one of the top ten free-market think tanks in the world (according to TheBestSchools.org).
The truth is that climate change does not require that we reduce energy consumption or replace fossil fuels with alternative energies.
Your father is right when he questions whether global warming is a genuine "crisis" or a product of hype and exaggeration by various interest groups. He is also right to suggest that the issue is being used to extort money from the United States, handicap American businesses, and undermine our economic growth and prosperity.
Claims That Global Warming Is Already Happening
The popular "evidence" that man-made global warming is already happening and is harmful consists mostly of images of melting ice, heat waves, hurricanes, and rising tides. These images appeared in Al Gore's movie, An Inconvenient Truth, and more recently in Leonardo DiCaprio's movie Before the Flood. Politicians and celebrities sometimes travel to the Arctic and come back saying they have "seen global warming," that "it is real and already happening." But these images and claims are highly misleading. You can't see man-made climate change. Climate is "average weather" over the course of at least 30 years. Extreme weather is always occurring sometime around the world, and always has and always will. Observing extreme weather events can't tell us whether the climate is changing, or what might be causing changes in weather or climate. For that, we need to view long-term trends, and even then we need to control for known climate cycles and natural variability.
Simply put, there simply is no hard scientific evidence that potentially harmful warming is happening. Dr. Benjamin Zycher, a scholar at the American Enterprise Institute, wrote in 2014 a short and accurate summary of research on long-term trends in extreme weather:

· There has been no temperature<http://www.drroyspencer.com/latest-global-temperatures/> trend over the last 15 years<http://www.ncdc.noaa.gov/monitoring-references/faq/anomalies.php>, notwithstanding the predictions<http://www.drroyspencer.com/2013/06/still-epic-fail-73-climate-models-vs-measurements-running-5-year-means/> of the models.

· The past two years have set a record for the fewest tornadoes<http://www.norman.noaa.gov/2013/05/low-tornado-numbers-and-low-tornado-deaths-may-2012-april-2013/> ever in a similar period, and there has been no trend<http://www1.ncdc.noaa.gov/pub/data/cmb/images/tornado/clim/EF3-EF5.png> in the frequency of strong (F3 to F5) tornadoes in the United States since 1950.

· The number of wildfires<http://wattsupwiththat.com/2012/06/28/what-global-warming-really-looks-like-michael-oppenheimer-fail/> is in a long-term decline.

· It has been eight years since a Category 3 or higher hurricane landed<http://www1.ncdc.noaa.gov/pub/data/images/2011-Landfalling-Hurricanes-11x17.pdf> on a U.S. coast; that long a period devoid of an intense hurricane landfall has not been observed since 1900. The 2013 Atlantic hurricane season<http://www.nhc.noaa.gov/2013atlan.shtml> was the least active in 40 years, with zero<http://www.accuweather.com/en/weather-news/2013-atlantic-hurricane-season/20467725> major hurricanes.

· There has been no trend<http://sciencepolicy.colorado.edu/admin/publication_files/2012.04.pdf> in the frequency or intensity of tropical cyclones, and tropical cyclone energy<http://policlimate.com/tropical/> is near its lowest level since reliable measurements began by satellite in the 1970s.

· There is no long-term trend in sea-level<http://tidesandcurrents.noaa.gov/sltrends/MSL_global_trendtablefc.html> increases. The record of changes in the size of the Arctic ice cover<http://www.worldclimatereport.com/index.php/2011/03/10/amazing-arctic-reconstructions/> is far more ambiguous than often asserted, because the satellite measurements began at the outset of the warming period from roughly 1980 through 1998.

· The Palmer Drought Severity Index<http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml> shows no trend since 1895. Flooding in the United States over the last century has not been correlated<http://www.tandfonline.com/doi/abs/10.1080/02626667.2011.621895>with increases in greenhouse gas concentrations.

Zycher's summary is supported by the sources he cites as well as four hefty volumes in the Climate Change Reconsidered series produced by the Nongovernmental International Panel on Climate Change (NIPCC<http://www.climatechangereconsidered.org/>) and published by The Heartland Institute. The NIPCC series is credible: It has been cited in more than 100 peer-reviewed articles. The Chinese Academy of Sciences thought so highly of it that it translated the first two volumes into Mandarin Chinese and published a condensed edition<https://www.heartland.org/publications-resources/publications/chinese-translation-of-climate-change-reconsidered> in 2013.

So no, there simply is no hard evidence that man-made climate change is already occurring or that it is bad. You should immediately suspect the credibility (or sincerity) of anyone who claims otherwise. They are using scare tactics to get you to think a certain way.

Appeals to Authority

Those who say global warming is a crisis ask you to believe the opinions of "experts" who, upon closer inspection, are unqualified, speaking outside their areas of expertise, or biased. For example, Al Gore, Leonardo DiCaprio, Bill McKibben, Bill Gates, and Naomi Orestes are not scientists. Senator Gore was flunking undergraduate physics at Harvard when he dropped out of that class.

President Obama's claim in 2014 that "97% of scientists agree: climate change is real, man-made and dangerous" is not supported by any credible survey or science literature review. NASA, on its website, cites four sources for this claim: two are essays written by college students, one literature review by a socialist historian, and the fourth one a literature review by an Australian blogger.

See Why Scientists Disagree about Global Warming<https://www.heartland.org/news-opinion/news/why-scientists-disagree-about-global-warming> for a full critique of each of these sources, and a summary of more reliable surveys and literature reviews that find extensive disagreement. A copy of that book is enclosed.

Alarmists often cite the reports of the United Nations' Intergovernmental Panel on Climate Change (IIPCC), but this is a political, not a scientific, organization. It conducts no original climate research. Its reports are not subject to traditional peer review, and they have become compilations of anecdotal evidence in support of a pre-ordained conclusion. That is not science. See the Nongovernmental International Panel on Climate Change'stestimony to the British Parliament<http://data.parliament.uk/writtenevidence/WrittenEvidence.svc/EvidenceHtml/4288> critiquing the latest IPCC report.

Finally, those who say global warming is a crisis often claim that those who disagree with them are either "paid shills of the oil industry" or part of a "vast right-wing conspiracy" that puts economic growth and

profits ahead of protecting the environment. Both claims are false.
Al Gore created the myth that global warming skeptics are paid by industry to "sow doubt," although he falsely claims it was discovered by a former reporter named Ross Gelbspan. There is no evidence of any "skeptic" ever being paid to lie about climate science or its impacts. See Russell Cook's excellent report on this myth titled Merchants of Smear<https://www.heartland.org/publications-resources/publications/merchants-of-smear>.
Once you look at the underlying science — the same sort of number crunching you would perform for a complicated business transaction — you will discover there is no scientific case for reducing our use of fossil fuels.
The Science, by the Numbers
Here are the key numbers you need to know to understand the climate change issue:
0.04% The concentration of carbon dioxide in the atmosphere, that's about 400 parts per million. In the past century it has only gone up by 0.01 percentage point. Carbon dioxide concentrations have risen and fallen before, in pre-industrial eras, without causing climate to change.
1.0 — 1.5C Climate sensitivity, the change in global temperature likely to result from a doubling of carbon dioxide in the atmosphere from pre-industrial levels. We are already half-way to such a doubling, so the warming in the coming century even assuming the alarmists in the debate are right and are not exaggerating, is likely to be too small be to noticeable against natural climate cycles and variability.
1 — 2 mm The long-term annual rise in sea level, since the end of the last Ice Age, which has not increased in the 21st century. This is too small to merit efforts to slow or stop global warming. Claims that sea level is rising faster are based on cherry-picked data sets and fail to take into account land subsidence in some coastal areas.
0.06C The reduction in global temperature that would be achieved by the year 2100 if the U.S. reduced its emissions by 40%, just six one-hundredths of one degree. This is too little to warrant the enormous cost — trillions of dollars — of replacing fossil fuels with renewable energy.
$3,900 The annual per-family cost of Obama's global warming policies, according to a study<http://www.freerepublic.com/focus/f-news/2237947/posts> by the Massachusetts Institute of Technology.
$27 billon How much federal agencies plan to spend on global warming-related programs in 2017.
What Should We Do?
We should all do our share to protect the environment. But the campaign to reduce energy use or to switch from fossil fuels to solar and wind power is not about protecting the environment. It's about something else.
Since climate is always changing due to natural causes, we should invest in resiliency (hardening infrastructure) and adaptation. Trying to stop global warming from occurring is not necessary, nor is it the best way to protect the environment.
Climate change is a small and remote threat, at best. We probably cannot slow or stop it even if we try. And the cost of ending our primary reliance on fossil fuels is astronomical.
My organization, The Heartland Institute, recommends<https://www.heartland.org/publications-resources/publications/action-plan-for-president-trump> your father's administration take the following steps regarding climate change:

* Create a President's Council on Climate Change, modeled after the President's Council on Bioethics<https://bioethicsarchive.georgetown.edu/pcbe/reports/past_commissions/> created by President George W. Bush in 2001 (and sunset in 2009), charged with cutting through the politics and bias that infected climate science and policymaking during the Obama administration and advising the President on what policies to repeal and what policies to pursue.
* Withdraw from the United Nations Framework Convention on Climate Change and the more recent Paris Accord and end funding for the United Nations' biased climate change programs, in particular the Intergovernmental Panel on Climate Change (IPCC) and Green Climate Fund.
* Replace EPA<https://www.heartland.org/publications-resources/publications/replacing-the-environmental-protection-agency?source=policybot> with a Committee of the Whole composed of the 50 state environmental quality agencies. Those agencies already have primary responsibility for implementing environmental laws passed by Congress and regulations written by EPA.
* Withdraw and suspend implementation of the Endangerment Finding<https://www.heartland.org/publications-resources/publications/comments-in-response-to-epas-

anpr-entitled-regulating-greenhouse-gas-emissions-under-the-clean-air-act> for Greenhouse Gases<https://www.heartland.org/publications-resources/publications/comments-of-the-heartland-institute-in-response-to-proposed-endangerment-and-cause-or-contribute-findings-for-greenhouse-gases> and the Clean Power Plan.

Please don't hesitate to contact me if you have any questions. While not a scientist myself, I have had the privilege of working with the Nongovernmental International Panel on Climate Change (NIPCC), an international team of independent climate scientists whose research supports the various statements made above, and who are willing to pitch in and help your father set a new course for climate policy in the years ahead.

Thank you for your concern and for your openness to differing opinions on this important issue.

Sincerely,

Joseph L. Bast
President

==========

To: Gadhia, Ami[agadhia@aap.org]
Cc: Hupp, Sydney[hupp.sydney@epa.gov]; Laris, Zachary[zlaris@aap.org]
From: Woodward, Cheryl
Sent: Mon 5/22/2017 10:42:32 AM
Subject: Re: EPA Attendees - AAP May 24th meeting w Administrator Pruitt

That's correct but call if you need assistance

Sent from my iPhone

On May 21, 2017, at 11:17 AM, Gadhia, Ami <agadhia@aap.org> wrote:

Thanks again Sydney and Cheryl - below is what I have for logistical details for Wednesday. Please let me know if anything is incorrect.

Kind regards,

Ami

If you are coming by taxi/vehicle, you want to be dropped off on 12th NW, between Constitution Ave and Pennsylvania Ave. It is almost exactly half way between the two avenues on 12th street and the Federal Triangle Metro sign can be used as a landmark. From 12th Street, facing the building with the EPA and American flags, walk toward the building (under the flags) and take the glass door on your left hand side with the escalators going down to the metro on your left. This again will be the South Lobby of the William Jefferson Clinton building.

Once inside the building, security will prompt you to scan all items such as bags, coats etc., and then let the guards know that you were instructed to call Cheryl Woodward at 564-1274 or Michelle Hale at 564-1430 to escort you to the meeting with the Administrator. Security will make temporary cards for everyone. Allow for 15 minutes to get through the process.

From: Gadhia, Ami
Sent: Friday, May 19, 2017 10:39 AM
To: Hupp, Sydney
Cc: Laris, Zachary; Woodward, Cheryl
Subject: RE: EPA Attendees - AAP May 24th meeting w Administrator Pruitt

Thank you!

From: Hupp, Sydney [mailto:hupp.sydney@epa.gov]
Sent: Friday, May 19, 2017 10:35 AM
To: Gadhia, Ami <agadhia@aap.org>
Cc: Laris, Zachary <zlaris@aap.org>; Woodward, Cheryl <Woodward.Cheryl@epa.gov>
Subject: RE: EPA Attendees - AAP May 24th meeting w Administrator Pruitt

Thank you for this! Ryan- Chief of Staff, Ruth- the Director of our Office of Children's Health Protection, and Wendy- Acting Assistant Administrator to the Office of Chemical Safety and Pollution Prevention.

Additionally looping in Cheryl, in case I haven't already, to provide logistical details for the day of.

Thank you!

Sydney Hupp

Executive Scheduler

Office of the Administrator

202.816.1659 (c)

From: Gadhia, Ami [mailto:agadhia@aap.org]
Sent: Friday, May 19, 2017 9:49 AM
To: Hupp, Sydney <hupp.sydney@epa.gov>
Cc: Laris, Zachary <zlaris@aap.org>
Subject: EPA Attendees - AAP May 24th meeting w Administrator Pruitt

Dear Sydney:

Thank you for your assistance in setting up a meeting with the AAP's leadership with Administrator Pruitt on Wednesday, May 24, 2017 at 9:30am. Can you tell me who will be

in attendance? Below are the attendees from the AAP:

Karen, Remley, MD, FAAP

CEO/Executive Vice President of the AAP

Jennifer Lowry, MD, FAAP

Chair, AAP Council on Environmental Health

Ami Gadhia, JD

Assistant Director, AAP Department of Federal Affairs

Thank you,

Ami

Ami V. Gadhia

Assistant Director, Department of Federal Affairs

American Academy of Pediatrics

601 13th Street NW, #400N

Washington, DC 20005

(202) 347-8600

www.AAP.org

@AmerAcadPeds

To: Woodward, Cheryl[Woodward.Cheryl@epa.gov]
Cc: Hupp, Sydney[hupp.sydney@epa.gov]; Laris, Zachary[zlaris@aap.org]
From: Gadhia, Ami
Sent: Mon 5/22/2017 4:13:21 PM
Subject: RE: EPA Attendees - AAP May 24th meeting w Administrator Pruitt

Will do, thank you Cheryl.

From: Woodward, Cheryl [mailto:Woodward.Cheryl@epa.gov]
Sent: Monday, May 22, 2017 6:43 AM
To: Gadhia, Ami <agadhia@aap.org>
Cc: Hupp, Sydney <hupp.sydney@epa.gov>; Laris, Zachary <zlaris@aap.org>
Subject: Re: EPA Attendees - AAP May 24th meeting w Administrator Pruitt

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Executive Scheduler

Office of the Administrator

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Karen, Remley, MD, FAAP

CEO/Executive Vice President of the AAP

Jennifer Lowry, MD, FAAP

Chair, AAP Council on Environmental Health

Ami Gadhia, JD

Assistant Director, AAP Department of Federal Affairs

Thank you,

Ami

Ami V. Gadhia

Assistant Director, Department of Federal Affairs

American Academy of Pediatrics

601 13th Street NW, #400N

Washington, DC 20005

(202) 347-8600

www.AAP.org

@AmerAcadPeds

To: Hupp, Sydney[hupp.sydney@epa.gov]
Cc: Laris, Zachary[zlaris@aap.org]; Woodward, Cheryl[Woodward.Cheryl@epa.gov]
From: Gadhia, Ami
Sent: Sun 5/21/2017 3:16:48 PM
Subject: Re: EPA Attendees - AAP May 24th meeting w Administrator Pruitt

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Kind regards,

Ami

If you are coming by taxi/vehicle, you want to be dropped off on 12th NW, between Constitution Ave and Pennsylvania Ave. It is almost exactly half way between the two avenues on 12th street and the Federal Triangle Metro sign can be used as a landmark. From 12th Street, facing the building with the EPA and American flags, walk toward the building (under the flags) and take the glass door on your left hand side with the escalators going down to the metro on your left. This again will be the South Lobby of the William Jefferson Clinton building.

Once inside the building, security will prompt you to scan all items such as bags, coats etc., and then let the guards know that you were instructed to call Cheryl Woodward at 564-1274 or Michelle Hale at 564-1430 to escort you to the meeting with the Administrator. Security will make temporary cards for everyone. Allow for 15 minutes to get through the process.

From: Gadhia, Ami
Sent: Friday, May 19, 2017 10:39 AM
To: Hupp, Sydney
Cc: Laris, Zachary; Woodward, Cheryl
Subject: RE: EPA Attendees - AAP May 24th meeting w Administrator Pruitt

Thank you!

From: Hupp, Sydney [mailto:hupp.sydney@epa.gov]
Sent: Friday, May 19, 2017 10:35 AM
To: Gadhia, Ami <agadhia@aap.org>
Cc: Laris, Zachary <zlaris@aap.org>; Woodward, Cheryl <Woodward.Cheryl@epa.gov>
Subject: RE: EPA Attendees - AAP May 24th meeting w Administrator Pruitt

Thank you for this! Ryan- Chief of Staff, Ruth- the Director of our Office of Children's Health Protection, and Wendy- Acting Assistant Administrator to the Office of Chemical Safety and Pollution Prevention.

Additionally looping in Cheryl, in case I haven't already, to provide logistical details for the day of.

Thank you!

Sydney Hupp

Executive Scheduler

Office of the Administrator

202.816.1659 (c)

From: Gadhia, Ami [mailto:agadhia@aap.org]
Sent: Friday, May 19, 2017 9:49 AM
To: Hupp, Sydney <hupp.sydney@epa.gov>
Cc: Laris, Zachary <zlaris@aap.org>
Subject: EPA Attendees - AAP May 24th meeting w Administrator Pruitt

Dear Sydney:

Thank you for your assistance in setting up a meeting with the AAP's leadership with Administrator Pruitt on Wednesday, May 24, 2017 at 9:30am. Can you tell me who will be in attendance? Below are the attendees from the AAP:

Karen, Remley, MD, FAAP

CEO/Executive Vice President of the AAP

Jennifer Lowry, MD, FAAP

Chair, AAP Council on Environmental Health

Ami Gadhia, JD

Assistant Director, AAP Department of Federal Affairs

Thank you,

Ami

Ami V. Gadhia

Assistant Director, Department of Federal Affairs

American Academy of Pediatrics

601 13th Street NW, #400N

Washington, DC 20005

(202) 347-8600

www.AAP.org

@AmerAcadPeds

To: Hupp, Sydney[hupp.sydney@epa.gov]
Cc: Laris, Zachary[zlaris@aap.org]; Woodward, Cheryl[Woodward.Cheryl@epa.gov]
From: Gadhia, Ami
Sent: Fri 5/19/2017 2:39:59 PM
Subject: RE: EPA Attendees - AAP May 24th meeting w Administrator Pruitt

Thank you!

From: Hupp, Sydney [mailto:hupp.sydney@epa.gov]
Sent: Friday, May 19, 2017 10:35 AM
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Assistant Director, Department of Federal Affairs

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601 13th Street NW, #400N

Washington, DC 20005

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@AmerAcadPeds

To: Gadhia, Ami[agadhia@aap.org]
Cc: Laris, Zachary[zlaris@aap.org]; Woodward, Cheryl[Woodward.Cheryl@epa.gov]
From: Hupp, Sydney
Sent: Fri 5/19/2017 2:35:13 PM
Subject: RE: EPA Attendees - AAP May 24th meeting w Administrator Pruitt

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Executive Scheduler

Office of the Administrator

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Ami V. Gadhia

Assistant Director, Department of Federal Affairs

American Academy of Pediatrics

601 13th Street NW, #400N

Washington, DC 20005

(202) 347-8600

www.AAP.org

@AmerAcadPeds

To: mcmurry.forrest@epa.gov[mcmurry.forrest@epa.gov]
From: Hupp, Sydney
Sent: Thur 6/1/2017 12:38:58 PM
Subject: Fwd: Map of lead action level exceedances
Lead_ALEs_map2017_5_30 (002).pdf
ATT00001.htm

Sent from my iPhone

Begin forwarded message:

From: "Greenwalt, Sarah" <greenwalt.sarah@epa.gov>
To: "Hale, Michelle" <hale.michelle@epa.gov>, "Hupp, Sydney" <hupp.sydney@epa.gov>
Subject: Fwd: Map of lead action level exceedances

Just wanted to make sure this made its way to the Administrator!

Sent from my iPhone

Begin forwarded message:

From: "Shapiro, Mike" <Shapiro.Mike@epa.gov>
To: "Greenwalt, Sarah" <greenwalt.sarah@epa.gov>, "Jackson, Ryan" <jackson.ryan@epa.gov>
Cc: "Grevatt, Peter" <Grevatt.Peter@epa.gov>, "Mclain, Jennifer" <Mclain.Jennifer@epa.gov>
Subject: FW: Map of lead action level exceedances

Sarah and Ryan,

I understand that at a meeting with the American Academy of Pediatrics, attended by OCHP, the Administrator asked for a map of communities with lead problems. Attached is a map of Public Water Systems with action level exceedances Special thanks to OGWDW for developing this informative graphic.

Mike

Michael Shapiro

Acting Assistant Administrator, Office of Water

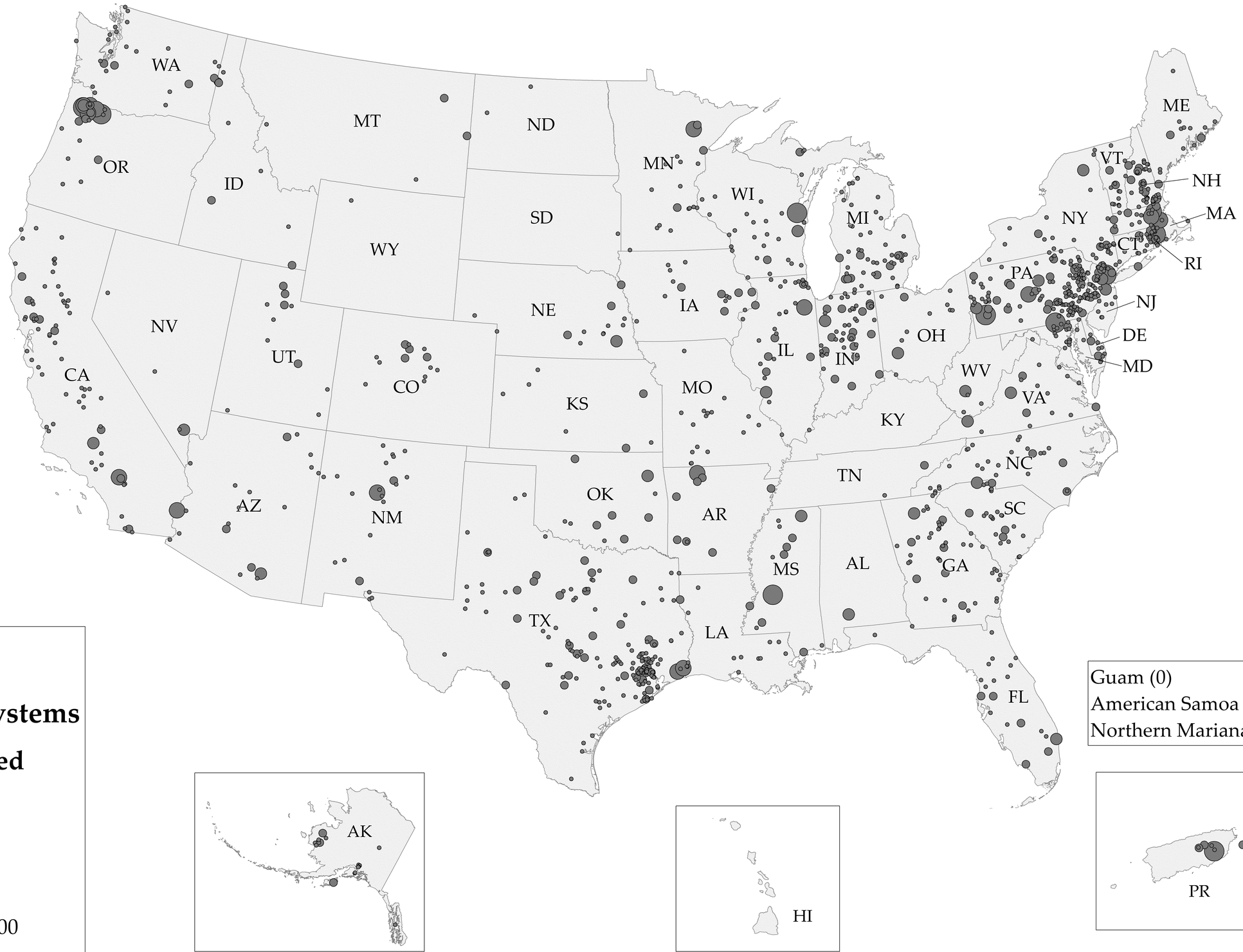
US EPA, 4101M

1200 Pennsylvania Ave., NW

Washington, DC 20460

202-564-5700

From: Mclain, Jennifer
Sent: Wednesday, May 31, 2017 4:22 PM
To: Shapiro, Mike <Shapiro.Mike@epa.gov>
Cc: Bergman, Ronald <Bergman.Ronald@epa.gov>; Thompkins, Anita <Thompkins.Anita@epa.gov>; Gonzalez, Yvonne V. <Gonzalez.Yvonne@epa.gov>; Grevatt, Peter <Grevatt.Peter@epa.gov>; Best-Wong, Benita <Best-Wong.Benita@epa.gov>; Wadlington, Christina <Wadlington.Christina@epa.gov>; Burneson, Eric <Burneson.Eric@epa.gov>; Plastino, Michael <Plastino.Michael@epa.gov>
Subject: Map of lead action level exceedances



Guam (0)
American Samoa (0)
Northern Mariana Islands (0)

Legend

Public Water Systems

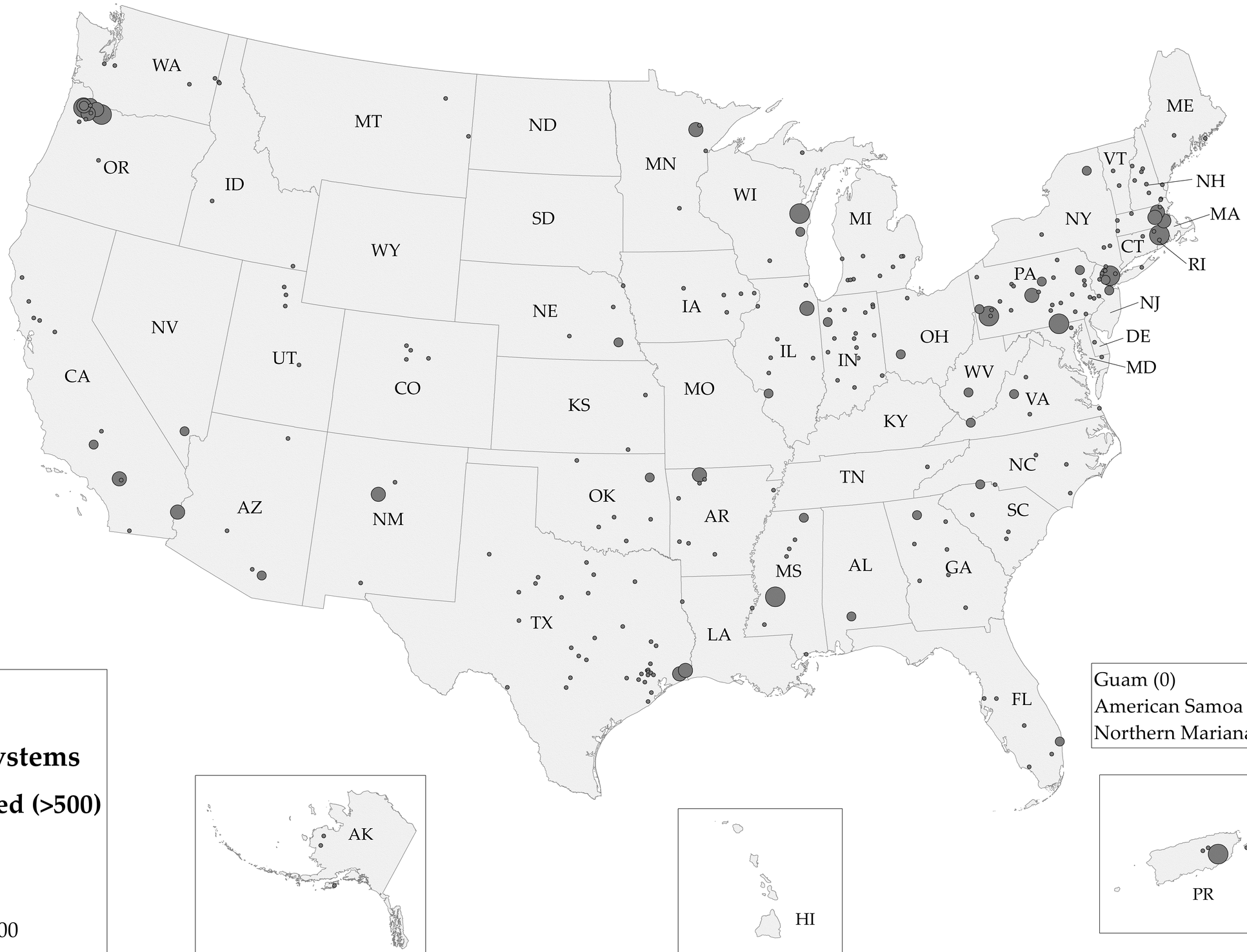
Population Served

- <= 500
- 501 - 3,300
- 3,301 - 10,000
- 10,001 - 100,000
- > 100,000

Map Produced on 5-30-17
Projection: North_America_Equidistant_Conic

Public Water Systems with Lead ALEs (1202 Systems)
[Most recent sample 1/1/2014-12/31/2016 is > 0.015 mg/L]

N
W E
S



Guam (0)
American Samoa (0)
Northern Mariana Islands (0)

Legend

Public Water Systems

Population Served (>500)

- 501 - 3,300
- 3,301 - 10,000
- 10,001 - 100,000
- > 100,000

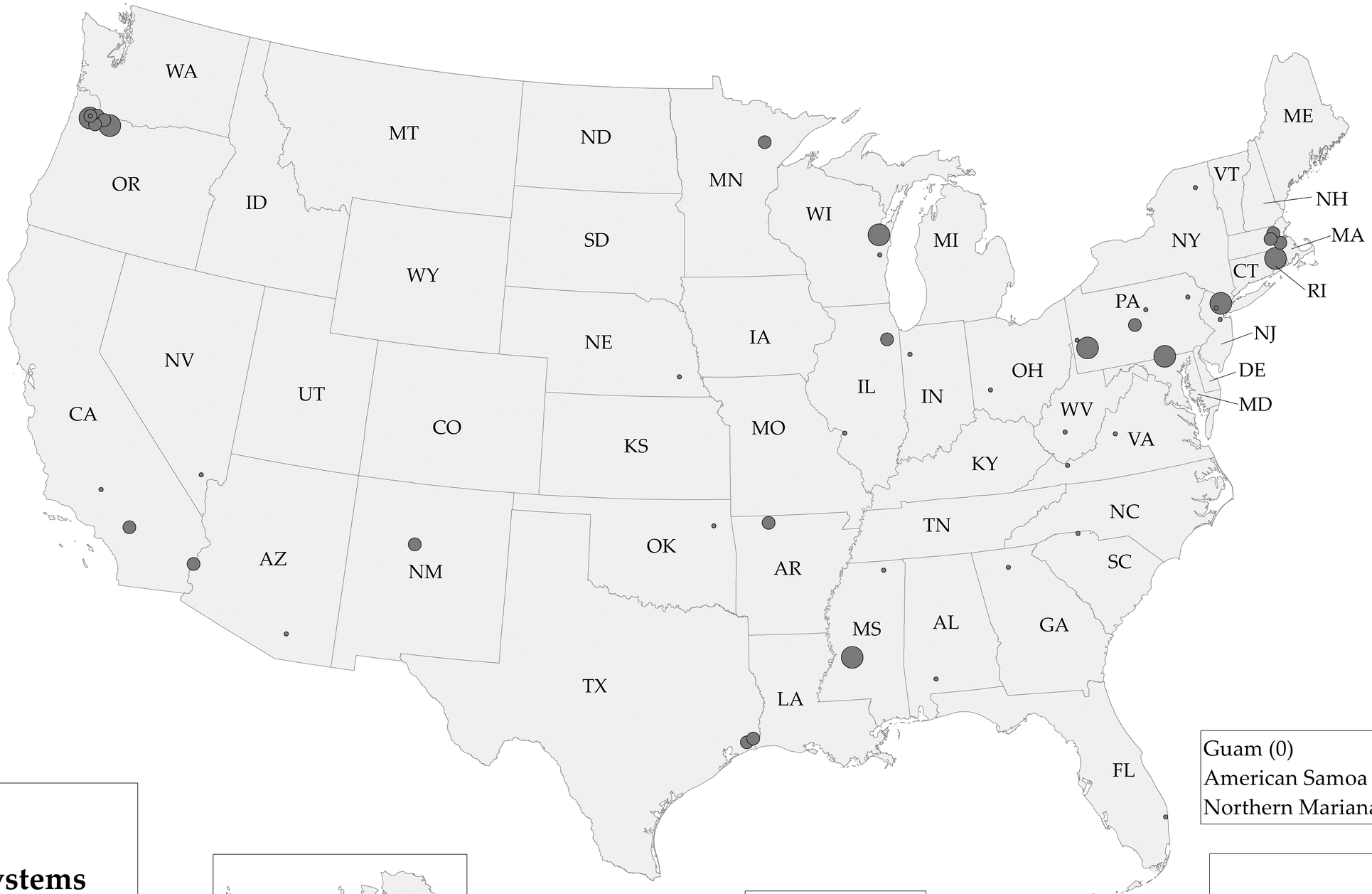
Map Produced on 5-30-17
Projection: North_America_Equidistant_Conic

Public Water Systems with Lead ALEs (270 Systems > 500 Pop Served)

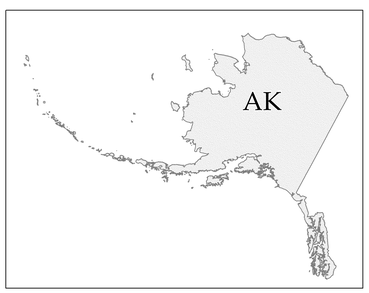
[Most recent sample 1/1/2014-12/31/2016 is > 0.015 mg/L]

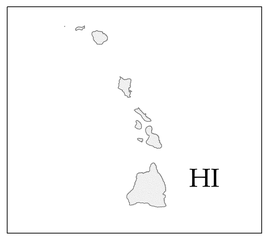
N
W E
S

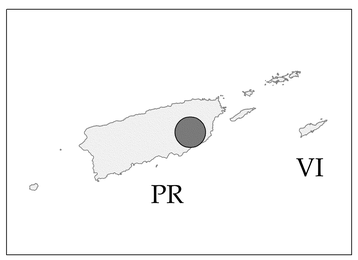
ED_001523B_00007324-00002



Guam (0)
American Samoa (0)
Northern Mariana Islands (0)







Legend

Public Water Systems

Population Served (>3,300)

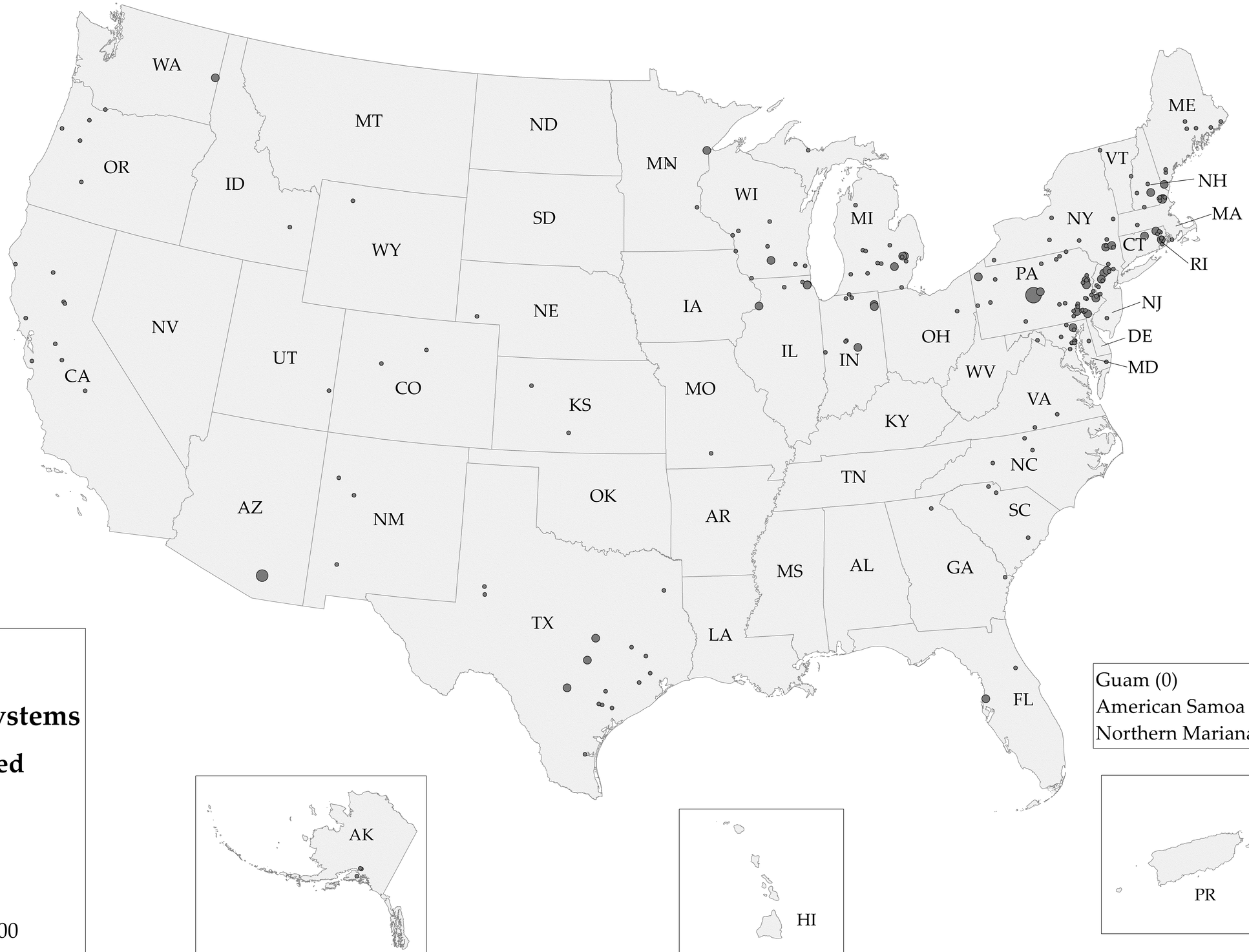
- 3,301 - 10,000
- 10,001 - 100,000
- > 100,000

Map Produced on 5-30-17
Projection: North_America_Equidistant_Conic

Public Water Systems with Lead ALEs (49 Systems > 3,300 Pop Served)
[Most recent sample 1/1/2014-12/31/2016 is > 0.015 mg/L]

N
W E
S

ED_001523B_00007324-00003



Guam (0)
American Samoa (0)
Northern Mariana Islands (0)

Legend

Public Water Systems

Population Served

- <= 500
- 501 - 3,300
- 3,301 - 10,000
- 10,001 - 100,000
- > 100,000

Map Produced on 5-30-17
Projection: North_America_Equidistant_Conic

Schools or Daycares with Lead ALEs (203 Systems)
[Most recent sample 1/1/2014-12/31/2016 is > 0.015 mg/L]

N
W E
S

ED_001523B_00007324-00004