Report of the Lead and Copper Rule Working Group To the National Drinking Water Advisory Council

FINAL

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Abbreviations

AL – Action Level
ALE – Action Level Exceedance
CCR – Consumer Confidence Report
CCT – Corrosion Control Treatment
DWLRP – Drinking Water Lead Reduction Plan
EPA – Environmental Protection Agency
LAL – Lead Action Level
LCR – Lead and Copper Rule
LCRWG – Lead and Copper Rule Working Group
LSL – Lead Service Line
LSLR – Lead Service Line Replacement
LTR LCR – Long Term Revisions to the Lead and Copper Rule
MCLG – Maximum Contaminant Level Goal
mg/L – Milligram per Liter
µg/L – Microgram per Liter
µg/dL – Microgram per Deciliter
NDWAC – National Drinking Water Advisory Council
OGWDW – Office of Ground Water and Drinking Water
OCCT – Optimum Corrosion Control Treatment
OWQP – Optimal Water Quality Parameter
PE – Public Education
pH – Negative log of hydrogen ion molar concentration
PLSLR – Partial Lead Service Line Replacement
POTW – Publicly Owned Treatment Works
POU – Point-of-use Treatment Device
PWS – Public Water System
SAB – Science Advisory Board
SDWA – Safe Drinking Water Act
DWSRF – Drinking Water State Revolving Fund
TT – Treatment Technique
WQP – Water Quality Parameter

Report of the Lead and Copper Rule Working Group to the National Drinking Water Advisory Council

1. Executive Summary

The Lead and Copper Rule Working Group (LCRWG) of the National Drinking Water Advisory Council (NDWAC) has completed its deliberations on issues associated with long term revisions to the Lead and Copper Rule (LCR). This report includes the group's findings and recommendations.

This executive summary provides a brief overview of the report. Details of the findings and recommendations are provided in the body of the report. A list of the members of the working group can be found in Appendix A.

1.1. Charge

The charge to the LCRWG was to provide advice to the NDWAC as it develops recommendations for the U.S. Environmental Protection Agency (EPA) on targeted issues related to long term revisions to the Lead and Copper Rule under the Safe Drinking Water Act (SDWA).

1.2. Findings and Recommendations

The anticipated Long Term Revisions to the Lead and Copper Rule (LTR LCR) is a very important opportunity for removing sources of lead in contact with drinking water and for reducing exposure to lead from drinking water in the meantime. Creative financing and robust public education also are essential.

The LCRWG took the following considerations, among others, into account in making recommendations for revisions to the LCR. A more detailed list of considerations is included in the full report.

There is no safe level of lead. Lead can pose health risks to anyone, but there are heightened risks for pregnant women, infants and young children and other vulnerable populations with both acute and chronic exposures. Effective elimination of leaded materials in contact with water and minimization of exposure to lead in drinking water is a shared responsibility; public water systems (PWSs), consumers, building owners, public health officials and others each have important roles to play. The lack of resources to reduce the sources of exposure in some communities, however, also raises important questions of disparate impact and environmental justice. Thus, creative financing mechanisms will be needed.

The LCR should remain a treatment technique rule, but it can be improved based on the scientific knowledge that has emerged since the current LCR was promulgated. Corrosion control treatment is complicated, and will vary based on specific circumstances in each public water system. Thus, regular updates to guidance by EPA based on the latest science and the creation of a national clearinghouse of information both for the public and for PWSs are needed.

The LCRWG considered but did not quantify the cost implications of its recommendations. An important factor in the group's deliberations was the principle that PWS and state resources should be focused on actions that achieve the greatest public health protection. Recognizing that lead service line (LSL) replacement programs will be costly in some locations, the LCRWG also encourages PWSs to incorporate

anticipated costs into their capital improvement program as appropriate to their situation, and urges states to include the costs of LSL replacement in their criteria for allocation of Drinking Water State Revolving Funds.

The LCRWG specifically recommends that EPA revise the LCR to:

- Require proactive lead service line (LSL) replacement programs, which set replacement goals, effectively engage customers in implementing those goals, and provide improved access to information about LSLs, in place of current requirements in which LSLs must be replaced only after a lead action level (AL) exceedance;
- Establish more robust public education requirements for lead and LSLs, by updating the Consumer Confidence Report (CCR), adding targeted outreach to consumers with lead service lines and other vulnerable populations (pregnant women and families with infants and young children), and increasing the information available to the public;
- Strengthen corrosion control treatment (CCT), retaining the current rule requirements to re-assess CCT if changes to source water or treatment are planned, adding a requirement to review updates to EPA guidance to determine if new scientific information warrants changes;
- Modify monitoring requirements to provide for consumer requested tap samples for lead and to utilize results of tap samples for lead to inform consumer action to reduce the risks in their homes, to inform the appropriate public health agency when results are above a designated household action level, and to assess the effectiveness of CCT and/or other reasons for elevated lead results;
- Tailor water quality parameters (WQPs) to the specific CCT plan for each system, and increase the frequency of WQP monitoring for process control;
- Establish a health-based, household action level that triggers a report to the consumer and to the applicable health agency for follow up;
- Separate the requirements for copper from those for lead and focus new requirements where water is corrosive to copper; and
- Establish appropriate compliance and enforcement mechanisms.

Although leadership by EPA is essential, reduction of exposure to lead in drinking water cannot be achieved by EPA regulation alone. Thus, this report also includes recommendations for renewed commitment, cooperation and effort by government at all levels and by the general public. We urge EPA to play a leadership role not only in the revisions to the LCR but also in educating, motivating, and supporting the work of other EPA offices; federal state and local agencies and other stakeholders. (See Section 4: Complementary Actions Critical to the Success of the National Effort to Reduce Lead in Drinking Water.)

2. Considerations and Background Information

2.1. Considerations in Preparing this Report

The members of the LCRWG brought different perspectives and expertise to the preparation of this report. Although not all members agreed with each and every consideration listed below, the LCRWG took one another's perspectives into account and, thus, the following concepts collectively underlie the recommendations in this report. Additional detail is provided in the recommendations section below.

- There is no safe level of lead. Lead can pose health risks to anyone, but there are heightened risks for pregnant women, infants and children with both acute and chronic exposures.
- Lead-bearing plumbing materials in contact with drinking water pose a risk at all times (not just when there is a lead action level (LAL) exceedance).
- Effective elimination of leaded materials in contact with water and minimization of exposure to lead in drinking water is a shared responsibility. PWSs, consumers, building owners, public health officials and others each have important roles to play.
- The LTR LCR is an important opportunity for removing sources of lead in contact with drinking water and for reducing exposure to lead from drinking water in the meantime. However, additional action beyond the scope of the Safe Drinking Water Act is needed. Removing lead from drinking water systems also will require renewed commitment, cooperation and effort by government at all levels and by the general public. (See Section 4: Complementary Actions Critical to the Success of the National Effort to Reduce Lead in Drinking Water.)
- Proactive action is needed to remove the sources of lead, with appropriate incentives both for PWSs and their customers needed to encourage such action.
- Successful implementation of the revised LCR can only take place in the context of a more holistic effort on lead in water issues involving stakeholders other than just EPA and water systems, and resources beyond those able to be brought to bear by water systems. Partnerships at all levels are essential. Recognizing that public agency budgets are tighter than ever, greater engagement by local health agencies, those funding housing programs, and those involved in permitting and construction is particularly important.
- Creative financing mechanisms also will be needed to achieve this goal for all individuals potentially exposed to lead, regardless of race, ethnicity or income. Leaving a lead service line in place because a low-income resident does not have the means to pay raises serious questions of disparate impact and environmental justice.
- The public plays a critical role in protecting their families' health by reducing exposure to lead and copper, and informing the public enables them to be effective participants in implementing their share of the responsibility.
- The issues associated with lead and copper are very different and warrant more separate attention than has been the case in the past.
- The LCR should remain a treatment technique rule, but it can be improved.
- Corrosion control treatment (CCT) is complex, dynamic, and varies based on the circumstances in each PWS. The understanding of the challenges with CCT has improved in recent years, but questions still remain.
- Attention to unintended consequences is important generally and, in particular, with respect to CCT.
- The presence of lead-bearing materials in premise plumbing raises issues about what systems can implement in customers' homes.
- Attention to what States are able to oversee and enforce also is important.
- PWS and state resources should be focused on actions that achieve the greatest public health protection.

2.2 Regulatory Background and Formation of the NDWAC Lead and Copper Work Group

Under the Safe Drinking Water Act EPA sets public health goals and enforceable standards for drinking water quality.[1] The Lead and Copper Rule is a treatment technique rule. Instead of setting a maximum contaminant level (MCL) for lead or copper, the rule requires (PWSs) to take certain actions to minimize lead and copper in drinking water, to reduce water corrosivity and prevent the leaching of these metals from the premise plumbing and drinking water distribution system components and when that isn't enough, to replace lead service lines under their control. The current rule sets an action level (AL), or concentration, of 0.015 mg/L for lead and 1.3 mg/L for copper. An AL is not the same as an MCL. An MCL is based on health effects and feasibility; whereas an action level is a screening tool for determining when certain treatment technique actions are needed.

The LCR action level is based on the practical feasibility of reducing lead through controlling corrosion. In the LCR, if the AL is exceeded in more than ten percent of tap water samples collected during any monitoring period (i.e., if the 90th percentile level is greater than the AL), it is not a violation, but triggers other requirements that include water quality parameter monitoring, corrosion control treatment (CCT), source water monitoring/treatment, public education, and lead service line replacement (LSLR). The rule also requires States to report the 90th percentile for lead concentrations to EPA's Safe Drinking Water Information System (SDWIS) database for all water systems serving 3,300 or more persons, and for those systems serving fewer than 3,300 persons only when the lead action level (LAL) is exceeded. States only report the 90th percentile for copper concentrations in SDWIS when the copper action level is exceeded in water systems regardless of the size of the service population. Public education requirements ensure that drinking water consumers receive meaningful, timely, and useful information that is needed to help them limit their exposure to lead in drinking water.

Copper is a common material used in household plumbing and drinking water service lines in the United States. Copper is an essential nutrient in small amounts; however, acute ingestion of excess copper in drinking water has been associated with adverse health effects, including acute gastrointestinal symptoms such as abdominal discomfort, nausea, and vomiting.

The SDWA requires EPA to set MCLGs at concentration levels at which no known or anticipated adverse effects would occur, allowing for an adequate margin of safety. EPA proposed an MCLG of 1.3 mg/l for copper in 1985, and finalized that MCLG in 1991 when the LCR was promulgated. The LCR set the action level (AL) for copper, the level at which treatment technique actions are triggered for the water system, equal to the MCLG. The AL is triggered if the 90th percentile level of water samples is exceeded. All community water systems must report the 90th percentile level and the number of samples that exceeded the 90th percentile in their Consumer Confidence Reports.

In early 2004, EPA began a wide-ranging review of the implementation of the LCR to determine if there was a national problem related to elevated levels of lead in drinking water. As part of its national review, EPA collected and analyzed lead concentration data and other information, carried out a review of implementation in States, held four expert workshops to discuss elements of the regulations, and worked to understand local and State efforts to monitor for lead in school drinking water, including a national meeting to discuss challenges and needs. EPA released a Drinking Water Lead Reduction Plan (DWLRP) in March 2005. This plan outlined short-term and long-term goals for improving implementation of the

[1] EPA establishes national primary drinking water regulations (NPDWRs) under SDWA. NPDWRs either establish a feasible maximum contaminant level (MCL) or a treatment technique "to prevent known or anticipated adverse effects on the health of persons to the extent feasible."

LCR. The plan can be found at the following web address:
http://water.epa.gov/lawsregs/rulesregs/sdwa/lcr/lead_review.cfm

In 2007, EPA promulgated regulations, which addressed the short-term revisions to the LCR that were identified in the 2005 DWLRP. These requirements enhanced the implementation of the LCR in the areas of monitoring, treatment, LSLR, public education, and customer awareness. These revisions were intended to better ensure drinking water consumers receive meaningful, timely, and useful information needed to help them limit their exposure to lead in drinking water.

A number of Safe Drinking Water Act (SDWA) amendments aim to reduce lead in drinking water by limiting the amount of allowable lead in plumbing materials that come into contact with drinking water. In 1986, the SDWA was amended to prohibit the "use of any pipe, any pipe or plumbing fitting or fixture, any solder, or any flux, in the installation or repair of (i) any public water system; or (ii) any plumbing in a residential or non-residential facility providing water for human consumption, that is not lead free". Lead Free was defined as solder and flux with no more than 0.2% lead and pipes with no more than 8% lead.

Congress again amended the SDWA in 1996, to prohibit the introduction into commerce of any pipe, pipe or plumbing fitting or fixture that is not lead free and to also require pipes, pipe or plumbing fittings or fixtures be in compliance with 3rd party lead leaching standards. These provisions ensure that only products meeting the lead free definition are sold in the U.S. and that pipes, pipe or plumbing fittings or fixtures are certified to be lead free.

The Reduction of Lead in Drinking Water Act of 2011 revised the maximum allowable lead content from not more than 8% to not more than a weighted average of 0.25% lead and included a calculation procedure for determining the weighted average; further reducing the amount of lead in contact with drinking water. It also eliminates the federal requirement to comply with the lead leaching standard and included exemptions from the lead free definition for plumbing devices that are used exclusively for non-potable services and also for specific plumbing devices such as toilets, bidets and urinals. The Community Fire Safety Act of 2013 further amended the SDWA to add fire hydrants to the list of exempted plumbing devices.

EPA has continued to work on the long-term issues that required additional data collection, research, analysis, and full stakeholder involvement, which were identified in the 2005 DWLRP and the 2007 rule revisions. This action is referred to as the LCR Long-Term Revisions (LTR). The LCR LTR would apply to all community water systems (CWSs) and non-transient non-community water systems (NTNCWSs). In this report, the term public water system (PWS) is meant to refer to both of these categories but not to transient non-community water systems.

Seeing the need for additional input on potential revisions to the Lead and Copper Rule, EPA requested that the National Drinking Water Advisory Committee (NDWAC) form the Lead and Copper Rule Working Group (LCRWG) to consider several key questions for the LCR LTR, taking into consideration previous input. The LCRWG met seven times in 2014 and 2015 to produce this report, and sought input from the NDWAC in advance of the last meeting to understand and address questions the NDWAC might have about the working group's recommendations.

A list of members of the working group is provided in Appendix A. This report was approved by the LCRWG, with one dissent.

3. Recommendations for Revisions to the Lead and Copper Rule

The long term revisions to the LCR is an important opportunity for removing sources of lead in contact with drinking water and for reducing exposure to lead from drinking water in the meantime. Creative financing and robust public education also are essential.

The LCRWG offers the following recommendations, based on information provided to the work group and on the work group's own deliberations. The LCRWG considers these recommendations to be an integrated package, not a menu of choices from which some recommendations can be selected and combined with others. This package reflects a concerted attempt to strengthen public health protection, which includes targeting the resources available to PWSs for the greatest public health value. While individual members might differ on specific recommendations, the work group (with one dissent) agrees that this package of recommendations constitutes an improvement over the current LCR.

The LCRWG carefully considered the information and questions posed by EPA in a white paper prepared for the working group. In its deliberations, the LCRWG came to the conclusion that the lessons learned from the implementation of the current LCR warranted a fresh look at the premises of the regulation. To truly solve the problem of exposure to lead in drinking water, the LCRWG concluded that lead-bearing materials should be removed from contact with drinking water to the greatest degree possible, while minimizing the risk of exposure in the meantime. That premise has led to a different paradigm for a revised LCR and, thus, to a somewhat different set of assumptions than underlay questions posed to the working group.

The diagram on page 12 illustrates the conceptual framework of the recommendations that follow.

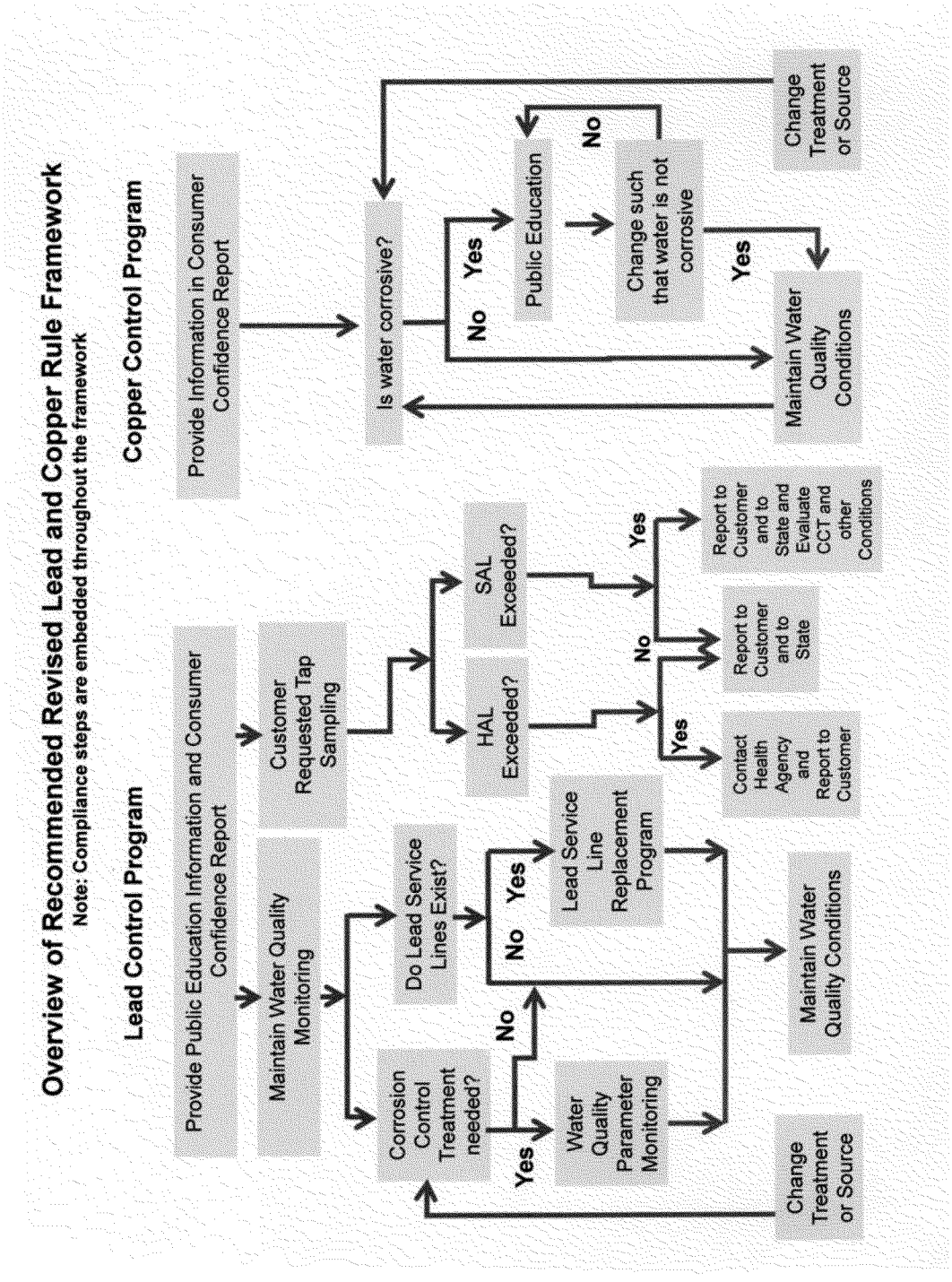
The LCRWG specifically recommends that EPA revise the LCR to:

- Require proactive LSL replacement programs, which set replacement goals, effectively engage customers in implementing those goals, and provide improved access to information about LSLs, in place of current requirements in which lead service lines (LSLs) must be replaced only after a lead action level (AL) exceedance and CCT;
- Establishes more robust public education, by creating a national clearinghouse of information for the public and templates for PWSs, by updating the Consumer Confidence Report, adding targeted outreach to consumers with lead service lines and other vulnerable populations (pregnant women and families with infants and young children), and increasing the information available to health care providers and the public;
- Strengthen corrosion control treatment (CCT), retaining the current rule requirements to re-assess CCT if changes to source water or treatment are planned, adding a requirement to review updates to EPA guidance to determine if new scientific information warrants changes;
- Modify monitoring requirements to provide for consumer requested tap samples for lead and to utilize results of tap samples for lead to inform consumer action to reduce the risks in their homes, to inform the appropriate public health agency when results are above a designated household action level, and to assess the effectiveness of CCT and/or other reasons for elevated lead results;
- Tailor water quality parameters to the specific CCT plan for each system, and increases the frequency of WQP monitoring for process control;

- Establish a health-based, household action level that triggers a report to the consumer and to the applicable health agency for follow up;
- Separate the requirements for copper from those for lead and focus new requirements where water is corrosive to copper; and
- Establish appropriate compliance and enforcement mechanisms.

Although leadership by EPA is essential, reduction of exposure to lead in drinking water cannot be achieved by EPA regulation alone. Thus, this report also includes recommendations for renewed commitment, cooperation and effort by government at all levels and by the general public. We urge EPA to play a leadership role not only in the revisions to the LCR but also in educating, motivating, and supporting the work of other EPA offices; federal, state and local agencies and other stakeholders. (See Section 4: Complementary Actions Critical to the Success of the National Effort to Reduce Lead in Drinking Water.)

Figure 1


Overview of Recommended Revised Lead and Copper Rule Framework
Note: Compliance steps are embedded throughout the framework
Lead Control Program
Provide Public Education Information and Consumer Confidence Report
Maintain Water Quality Monitoring
Corrosion Control Treatment needed?
Yes
No
Do Lead Service Lines Exist?
No
Yes
Lead Service Line Replacement Program
Water Quality Parameter Monitoring
Maintain Water Quality Conditions
Change Treatment or Source
Customer Requested Tap Sampling
HAL Exceeded?
SAL Exceeded?
Yes
No
Yes
No
Contact Health Agency and Report to Customer
Report to Customer and to State
Report to Customer and to State and Evaluate CCT and other Conditions
Copper Control Program
Provide Information in Consumer Confidence Report
Is water corrosive?
No
Yes
Public Education
Change such that water is not corrosive
No
Yes
Maintain Water Quality Conditions
Change Treatment or Source

3.1. Replace Lead Service Lines[2]

Removing the sources of lead in drinking water should be a national goal. More proactive action than has taken place to date is needed to achieve it.

Although success in achieving this goal will require a concerted effort by many and can not be accomplished solely through the authorities provided under the Safe Drinking Water Act, revisions to the Lead and Copper Rule are an important component to achieving this goal and should be structured accordingly. [See Section 4 for recommendations that complement revisions to the LCR.]

The existing LCR has not created sufficient incentives to fully replace LSLs and other sources of lead , because LSL replacement is only required when the lead AL has been exceeded and optimizing CCT is insufficient to bring a system back under the action level. Systems that do not exceed the lead AL will never have to implement a LSL replacement program. Further, the link to action level exceedance does not allow adequate time for a well-planned LSLR program, and a significant unintended consequence where systems have had to implement a LSL replacement program quickly has been an increase in partial LSL replacement.

EPA asked the Science Advisory Board (SAB) to evaluate the current scientific data regarding the effectiveness of PLSLR and the review centered around five issues: (1) associations between PLSLR and blood lead levels in children; (2) lead tap water sampling data before and after PLSLR; (3) comparisons between partial and full LSLR; (4) PLSLR techniques; and (5) the impact of galvanic corrosion. The SAB found that the quantity and quality of the available data are inadequate to fully determine the effectiveness of PLSLR in reducing drinking water lead concentrations. The small number of studies available had major limitations (small number of samples, limited follow-up sampling, lack of information about the sampling data, limited comparability between studies, etc.) for fully evaluating PLSLR efficacy.

While recognizing the limits to current data, the SAB concluded that PLSLRs have not been shown to reliably reduce drinking water lead levels in the short-term, ranging from days to months, and potentially even longer. Additionally, PLSLR is frequently associated with short-term elevated drinking water lead levels for some period of time after replacement, suggesting the potential for harm, rather than benefit during that time period. The available data suggest that the elevated tap water lead levels tend to increase then gradually stabilize over time following PLSLR, sometimes at levels below and sometimes at levels similar to those observed prior to PLSLR. The SAB also concluded that in studies comparing full LSLR versus PLSLR, the evaluation periods were too short to fully assess differential reductions in drinking water lead levels. However, the SAB explained that full LSLR appears generally effective in achieving long-term reductions in drinking water lead levels, unlike PLSLR. Both full LSLR and PLSLR generally result in elevated lead levels for a variable period of time after replacement. The limited evidence available suggests that the duration and magnitude of the elevations may be greater with PLSLR than full LSLR.

Taking all of these considerations into account, the LCRWG has concluded that an effective framework for replacement of LSLs would include the following and, thus, the LCR should be revised accordingly:

[2] 40 CFR 141.2 defines: "*Lead service line* means a service made of lead which connects the water main to the building inlet and any lead pigtail, gooseneck or other fitting which is connected to such lead line."

- Requiring all PWSs to establish a LSL replacement program that effectively informs and engages customers to share appropriately in fully removing LSLs, unless they can demonstrate that LSLs are not present in their system;
- Modifying the definition of lead service lines to include any service line where any portion, including a lead pigtail, gooseneck or other fitting, is made of lead;
- Clear guidance, case studies, and templates for LSL replacement programs, including a toolkit of ideas for creative financing strategies;
- Targeted outreach to customers with LSLs, with information about the risks of lead exposure, an offer to test a tap sample, and information about and encouragement to participate in the LSL replacement program;
- Dates by which systems should have met interim goals and completed replacement of all LSLs and PLSLs, without penalty to PWSs for those homeowners who refuse to participate in the replacement program as long as the PWS has made a meaningful effort to work with such a homeowner;
- Creating incentives for understanding where LSLs and PLSLs exist, while making action on full replacement, rather than on investigation of the location of LSLs and PLSLs the priority;
- Maintaining ongoing-outreach to homeowners where LSLs or PLSLs still exist;
- Implementation of standard operating procedures (SOPs), either from EPA guidance or tailored to the system, that helps define operations that disturb LSLs and practices to minimize disturbance and consumer exposure to lead;
- Stronger programs to educate consumers, and to provide test results of tap samples at the request of consumers;
- Focus efforts on action to replace LSLs rather than on the time and expense of upfront plan approval and on using simplified reporting to the states so they would only need to intervene when problems arise; and
- Requirements that provide strong encouragement for full LSL replacements, with the understanding that there may be justifiable exceptions and that those exceptions would occur only after the efforts outlined in the recommendations below on the part of the PWS to work with customers to complete a full LSL replacement. Such exceptions might include emergency repairs where property owners have refused to participate in a full LSL replacement; during a main replacement project; or when a sufficiently high percentage of property owners participate in an area-wide LSL replacement project to justify replacing LSLs to the property lines of those who do not participate at the time. Revisions to the LCR should include options for risk management to occupants of those properties with remaining, partial lead service lines, e.g. additional sampling, filters, dielectrics to reduce the risk of galvanic corrosion, plastic piping, aggressive premise flushing, etc.

3.1.1. Update Inventories and Improve Access to Information about Lead Service Lines

Updating and improving access to information about the location of both full and partial lead service lines is both essential to ensuring LSLs are replaced and important for successful, proactive outreach to customers who are most likely to have a LSL.

The LCRWG recommends combining:

1) The presumption that a service line put in place prior to the date when lead service lines were prohibited has leaded materials unless the PWS has information to confirm that it not, with

2) Providing credit to a PWS toward its replacement goals for demonstrating that a service line presumed to include lead does not have leaded materials.

This approach is intended to create incentives for prompt action to develop an accurate inventory of LSLs and PLSLs in part by being overly conservative initially on the potential existence of LSLs, time to organize an effective replacement program, and an opportunity to take action to replace LSLs rather than devoting time and resources on planning documents that must be approved by the primacy agency.

The LCRWG recognizes that PWSs vary in the amount of information they have about the location of full and partial LSLs. EPA should take the impact on small and medium systems into account when developing the proposed rule.

The LCRWG also recognizes that the current definition of a lead service line exempts a service line that has a lead pigtail or gooseneck or other fitting but is otherwise not made of lead. We recommend that the LCR be revised to remove this exemption since a lead pipe, even if only a small portion, poses a sufficiently similar risk as a full lead service line. Because utilities may not know where these portions are and may not be able to locate them without excavating, we recommend that the presumption described above not apply to lines where the utilities do not have information or are unaware of their use. Finally, we recommend that these fittings be replaced when they are encountered during excavations and that the applicable operations and customer engagement requirements described in the next section apply.

In addition, the LCRWG recommends that all PWSs should establish a clear mechanism for customers to access information on LSL locations (at a minimum). Detailed public education recommendations for both lead and copper follow in separate sections. With respect to information about LSLs, PWSs should:

- Have outreach materials that indicate that property specific information is available.
- Inform customers who may have LSLs about the risks of partial line replacement, who is responsible for paying for replacing the service line, and the legal basis of that determination.
- Provide information it has about LSLs to existing home owners and residents on request.
- Provide information to realtors, home inspectors, and potential home buyers on request
- Communicate that this information is subject to disclaimer for accuracy based on information available to the PWS.
- Develop a system to track LSL replacement.

Where a service line serves multiple dwellings or places such as schools or child care centers that have many children, EPA should establish a formula for giving an extra weight or numerical count to these

lines in the initial inventory to recognize the additional children that would be affected and effectively prioritize replacement of these LSLs.

3.1.2. Establish Active LSL Replacement Programs

Proactive LSL replacement programs by PWSs and their customers are key to moving to a future in which lead is not in contact with drinking water. To accomplish this, the LCRWG recommends replacing the current regulations, in which LSL replacement is required only if a PWS has a lead AL exceedance and after the PWS takes action to operate CCT, because this has not resulted in the complete replacement of many LSLs across the country. [3]

Instead, a revised LCR should include a requirement that all PWSs with lead service lines prepare and implement a LSL replacement program, along with a combination of changes to the regulatory approach described in this report and supportive actions by other public and private agencies, customers and other stakeholders. Taking this approach has the advantages of making replacement of LSLs something all systems do and of establishing programs that are put in place in an organized and measured way.

Supportive actions include increased funding of federal lead risk reduction programs under the Department of Housing and Urban Development (HUD) to help fund customer-owned portions of LSLs and to consider federal tax deductions for this purpose. Additionally, states should pass legislation requiring inspection, disclosure and/or replacement of LSLs on sale of property, and when lines have been disturbed as part of a renovation. Details on these and other ideas are included in Section 4 of this report.

The LCRWG recommends that EPA include the following revisions to the LCR:

1. *Goal:* PWSs will work with their customers to implement full replacement of all lead service lines in their service areas according to the milestones outlined in Table 1. Revisions to the LCR should maximize the likelihood of achieving this goal, consistent with the recommendations in this section. EPA should urges PWSs to work with their customers to replace LSLs in their service areas more quickly, while recognizing that the recommended approach of replacing LSLs in all PWSs with LSLs adds a new and potentially costly requirement for utilities and their customers with LSLs who currently are not and may not ever be triggered into a LSLR program under the current rule.

2. *Interim Milestones:* PWSs that identify LSLs in their inventory should be required to perform targeted outreach to customers on the inventory of LSLs and to work with them to replace LSLs according to a sequence of three-year milestones,[4] beginning 36 months after the effective date of a revised LCR. Milestones would be set at a faster pace in earlier years and would recognize progress may be more difficult to achieve in later years with those LSLs that remain at that time. Table 1provides an illustration of this concept. PWSs should be encouraged to contact a larger number of homeowners than needed for compliance, since some homeowners may fail to reply or may refuse to participate. If replacement goals are not met, the revised LCR should require the PWS to take additional actions intended to enhance interest in and incentives for customer participation in full LSL replacement. The details of this approach should be determined by EPA with the intent of the LCRWG being that the PWS be given the flexibility to choose among

[3] EPA estimates that there were approximately 10.5 million LSLs in 1988 before the promulgation of the LCR and approximately 7.3 million LSLs now.
[4] Three years is a standard reporting timetable for drinking water regulations.

options that are appropriate for the size and type of ownership of the system and that the number of required efforts would increase over time if replacement goals are not met. EPA should seek to add to the initial list of options suggested in Table 2 to ensure a robust menu for PWSs to choose from (again considering system size and type of ownership) to avoid a situation where a PWS is forced into specific actions; and EPA should set the number of required efforts with consideration for the number and feasibility of choices provided.

3. *Replacement Credit:* The following actions can be counted toward the cumulative replacement requirement:
   - Full LSL replacement
   - Replacement of lead pigtail where the pigtail is the only leaded material on the service line
   - Confirmation that an LSL included in the initial inventory is not lead.

   PLSLR will not be counted toward this requirement. Lack of response or refusal to participate by the customer also will not count toward replacement milestones.

4. *Targeted Outreach*: EPA should create a list of options in the rule of approved outreach methods for contacting customers with LSLs and inviting them to participate in the utility's LSLR program. Table 2 provides an initial list of options for such resident engagement, along with additional system policies and other actions if milestones aren't met. EPA also should provide guidance and/or templates for these options. For compliance purposes, the revised LCR should require that a PWS individually notify customers with known or possible LSLs describing the risks of lead in drinking water, specifically inviting them to participate in the LSLR program, and clearly describing the terms of the program, and how to follow up. If the customer does not respond or chooses not to participate, the PWS must follow up with another invitation at least every three years and always when there is a new customer at that address until the full LSL is replaced.

5. *Control and Responsibility:* The revised LCR should require PWSs to clearly state how the PWS defines ownership of LSLs, who has what financial responsibility for the replacement, what the legal basis is for that determination and any financial assistance programs that may be available.

6. *Planning and Financing Options:* EPA should provide a template and guidance for planning LSL replacement programs, including reference to options to assist customers replace their portion of lead service lines. Small systems may wish to refer to a national information source, such as one provided by EPA; large systems may wish to tailor such information to their circumstances. (See section 4 for further detail.)

7. *Operations and Customer Engagement:* EPA also should provide guidance on PWS policies and procedures for how to engage customers in full lead service line replacement and to inform them on appropriate risk reduction measures. PWSs should adopt templates provided in guidance by EPA or, for larger systems, their own standard operating procedures (SOPs) and make them available to their customers and the primacy agency for:

   a) planned capital projects by the PWS that would require:
      - Prior notification (e.g., 45 days prior to planned main replacement or repair) - Contact letter to affected households likely to have lead service lines, providing information about lead service lines, associated risk, risk reduction options, and full lead service line replacement options.

- Reminder of flushing post LSLR (e.g., 48 hours prior to actual field work affecting structure) -- Door hanger (or alternative direct contact) with information on flushing and POU devices immediately after lead service line replacement.

b) emergency main and service line repairs by the PWS that would define how to manage potential disturbance to LSLs safely:
   - Direction to information on lead service lines, associated risk, risk reduction options, and full-lead service line replacement options.
   - Door hanger (or alternative direct contact) with information on flushing and POU devices immediately after lead service line replacement.

c) flushing of service lines after lead service line replacement:
   - Flush outside hose bib or similarly located spigot close to the meter
   - Initial flush followed by house flush by homeowner or plumber using multiple taps to maximize water velocity
   - Information on proper use of filters when lead levels might be high

d) Requiring PWSs to inform other utilities (e.g. power, cable) whose work might affect water service lines or water mains, both proactively and at "mark out" for specific projects, about how to manage potential disturbances safely and about information to provide residents of affected homes about potential risks and risk mitigation measures. Those other utilities would have the responsibility to alert residents.

8. Community and NTNC water systems (schools, hospitals, churches, jails, etc.) who own the system and control the entire distribution system should replace LSL's as soon as practical, at a timetable to be determined by EPA. This requirement would not apply to community systems where the majority of the connections are individual residential connections (such as mobile home parks and HOA's) where there may be complications due to property ownership of the residence.

The LCRWG discussed and agreed that EPA guidance should encourage PWSs to make every effort to ensure that LSL replacement provides equal protection to low income customers (or rental units with low income residents), people of color and others protected by civil rights law and policy. Environmental justice and civil rights considerations are particularly important in those jurisdictions where the PWS requires the property owner to pay a share of the costs of removing the LSL. Making environmental justice a priority can be achieved through creative financing programs for low-income customers and setting priorities for which neighborhoods are targeted first for LSLR to ensure equal treatment of low income neighborhoods.

The LCRWG also discussed but did not agree that the definition of control as ownership should be changed in the revised LCR. In the current LCR, when a system exceeds the LAL, EPA requires water systems to replace only that portion of the LSL that it owns. This is based on EPA's current interpretation of the term "control" in the definition of public water system as limited to ownership. Some members of the LCRWG urged that the current definition of control as "ownership" should be replaced with a requirement that PWSs must replace the entire LSL, where they have the authority to "replace, repair, or maintain" the line or where they have other forms of authority over the LSL. However, the LCRWG also recognized that some utilities are prevented by law from spending public funds on private property and that gaining physical access to private property poses significant legal issues when a property owner objects.

The LCRWG does agree that the revised LCR should require PWSs to inform customers about the scope of their responsibility with regard to LSL replacement and the legal basis for that decision.

3.1.3 LSL Compliance

3.1.3.a LSL Replacement Compliance

Recordkeeping:
- Inventory of LSLs
- Customer refusals to participate in full LSL replacement

Reporting: At the end of each three year period, each PWS must provide to the primacy agency:
- Certification of the outreach and other efforts implemented (see Table 2 for initial examples);
- Report on the change in the number of LSLs removed from the inventory with better information;
- Report on the number of full LSLs replaced; and
- Report on locations where the utility side LSL was replaced, but the homeowner did not replace the private portion

Violations:
- Failure to conduct required outreach;
- Failure to step up intensity of efforts if 3-year LSL replacement target has not been met;
- Failure to provide on-going outreach to new customers and to follow up (at least every 3 years) with customers at locations with full or partial LSL who do not respond or chose not to participate in the LSL replacement program;
- Outreach materials do not meet the content requirements of the rule

3.1.3.b Operations and Customer Engagement Compliance

PWS must maintain records of who was notified, when notice was given, and content of notice for each capital project. (for 7a and 7b)

Violations:
- Lack of timely notice to customer that LSL removal is scheduled
- Notice materials do not meet rule content requirements

PWS also must develop SOP, and maintain records that it was provided to all utilities conducting activities which may impact LSL (for 7d)

Violation:
- PWS has not developed an SOP (or adopted an SOP template available on the National Clearinghouse) or not provided it to other utilities

3.2 Develop Stronger Public Education Requirements and Programs for Lead and LSLs

Given the public's role in the shared responsibility nature of the LCR, notifying and educating the public about lead in drinking water is important for risk reduction. Public education about the risks of lead in drinking water also is important regardless of whether LSLs are present, since lead can be present in other

premise plumbing materials. Moreover, targeted outreach and, possibly, other efforts are a key to the success of LSL removal programs. The current LCR does not adequately focus on creating on-going opportunities to educate customers on the risks of LSLs or on opportunities to replace them, especially when action is most likely, e.g. at the sale of a home.

The objectives of public education programs should include consumer understanding of: 1) the risks of lead in drinking water; 2) the likelihood that the water in one's home may contain lead; 3) the LCR as a "shared responsibility" rule; and 4) the availability of additional resources that consumers can use to better minimize their exposure to lead.

Although the LCRWG was briefed on and has experience with public education requirements and practices, it does not include members whose specific area of expertise is consumer-centered risk communication. Thus, the LCRWG generally recommends that public education programs for lead should move away from past practices of one-way communication from "experts" to the "public" toward newer concepts of risk communication that involve sustained, multiple, two-way channels of ongoing communication and partnership with the public.[5] EPA should consult with those with such expertise about the outreach and communication recommendations in this report, and encourage and apply best practices in effective ways to communicate with the public.

Communication in languages appropriate to the demographics of the community, in clear terms understandable by the public, and with engaging, reader-friendly graphics, photos, and video all help achieve greater understanding. Outreach programs and materials can be improved by involving people with diverse, and consumer-oriented expertise and perspectives, including consumer-centered risk communication experts, community members with extensive experience with lead in water including individuals not necessarily affiliated with an organization, lead/copper corrosion experts, grassroots public-health workers, and staff of PWSs, state and federal regulatory agencies and public health agencies. This information can and should be conveyed in different ways and through different communication channels, tailored to the specific circumstances.

Thus, with these and other considerations in mind, the LCRWG recommends that EPA, in consultation with the aforementioned stakeholders and drawing on principles of consumer-centered risk communication:

- Establish an easily accessible, national clearinghouse of information about lead in drinking water to serve the needs of the public and of public water systems (section 3.2.1).
- Require information be sent to all new customers on the potential risks of lead in drinking water (section 3.2.2)
- Revise the current CCR language to address lead service lines and update the health statements (section 3.2.3).Add requirements for targeted outreach to customers with lead service lines (section 3.1.1).

[5] Resources include: 1) EPA's "Risk Communication in Action" (http://nepis.epa.gov/Adobe/PDF/60000I2U.pdf); 2) EPA's "7 Cardinal Rules of Risk Communication" (http://www.wvdhhr.org/bphtraining/courses/cdcynergy/content/activeinformation/resources/epa_seven_cardinal_rules.pdf); and 3) Education & Communication WG Report 2010; National Conversation on Public Health and Chemical Exposures (http://www.resolv.org/site-nationalconversation/files/2011/02/Education_and_Communication_Final_Report.pdf)

- Strengthen requirements for public access to information about lead service lines, tap monitoring results, and other relevant information (section 3.2.4).
- Expand the current requirements for outreach to caregivers/health care providers of vulnerable populations (section 3.2.5)

As part of EPA's consultation with the aforementioned communication experts and stakeholders, the LCRWG recommends that EPA include consultation about methods that would increase public awareness of and motivation to learn about the effects of lead in drinking water and the benefits of removing these materials and/or taking regular precautions when cooking or drinking, regardless of whether LSLs are present or there has been a lead AL exceedance. Consistent with this advice, EPA also should take small systems into account and consider whether such methods should be included in guidance or in revisions to the LCR.

3.2.1 National Lead in Drinking Water Clearinghouse

The LCRWG recommends that EPA take the lead, working with other partners to establish a national, accessible information clearinghouse. The LCRWG suggests that this information clearinghouse include a website, that the materials on the web site be accessible for distribution through the Safe Drinking Water Hotline for those who may not have internet access, and that EPA investigate and apply newer communication technologies and ideas for interactive or other innovative means of communication with the public about lead in drinking water (e.g. social media methods and outreach programs)

The clearinghouse should include information in multiple languages, in clear terms understandable by the public, and should include engaging, reader-friendly graphics, photos, and video. EPA is encouraged to include the design of the clearinghouse in its consultation with people with diverse, and consumer-oriented expertise and perspectives described above.

Such a clearinghouse would be intended for use by the general public, PWS's, public health agencies, and health professionals. It should include:

- information and educational materials for the public that the public could access directly and that PWSs could use to meet many of the public education requirements of the LCR.
- guidance and templates, particularly for small systems, on SOPs for compliance with the LCR (e.g. templates for communicating lead monitoring results to individual customers, templates for explaining to customers how to obtain information on whether their service line could be lead, templates for standard operating procedures related to the LSL replacement program recommendations above, etc).
- Principles and guidelines for best practices in developing the content of the public education materials.
- Case examples of how communities have been successful in lead inventory updates and removal programs, information about funding sources, model ordinances or other types of authorities PWSs have to enable them to implement full LSL replacements, and contacts to other relevant agencies.

Further, EPA should consider best practices in methods for achieving greater public awareness of the clearinghouse so that it reaches as many people as possible.

The web site should include the following information:

Health risks

- Clear and prominent statement that no level of lead in drinking water is safe for human consumption and that a short-term exposure to a young child can result in permanent harm to the brain if the levels are high enough.
- Clear and distinct language on the health risks of consuming lead in drinking water
- Identification of the most vulnerable populations
- Importance of drinking water plumbing as a lead source
- How to have blood lead levels (BLLs) checked and limitations of testing
- How to have water tested and limitations of testing
- List of labs for testing water other than the utility and what to ask for in terms of number and size of bottles, diameter of mouth of bottles, analysis that measures lead particles, etc.

Forms of lead in water and health risk implications

- Soluble
- Particulate
- Unpredictability of lead release

Sources of lead in drinking water

- LSLs
- Other lead-bearing plumbing
- Scale on internal plumbing that can be a source of lead from present or past LSLs

Identification of service line material

- How to recognize a pipe that is made of lead (and when not to check due to age of home)
- What to do about galvanized pipe and why it is a potential source of lead

For homes with LSL

- LSL ownership
- Difference between full and partial lead service line replacement (physically and in terms of health risks)
- Benefits to full LSL replacement
- Actions to take if you have a partially replaced LSL
- Available methods for LSL removal
- Opportunities for removal, approximate cost, and financing options
- Overall benefits to the community of removing LSLs fully (lower treatment costs, better community health, environmental, etc.)
- Where applicable, requirements for notification during real estate transfer or new rental

Health-protective actions

- Precautionary water-use practices
- Role of filters and proper maintenance of them if they are used
- Replacement of leaded plumbing with lead-free plumbing

Additional information

- How to contact your utility and request a LSL inspection and/or water test
- Where applicable, reference to utility-specific website with local lead-related documents and data (e.g. Consumer Confidence Reports (CCRs), sampling protocol used for LCR compliance, lead-in-water test results, etc.)

- What you need to know about lead in water in schools and day care centers (it is not regulated, and link to national website that provides more information)
- Reference to a national website that provides a video version of basic educational information, including information on how the LCR works (with minority language versions)
- Other standard operating procedures, model ordinances, or templates for compliance with the revised LCR
- Where to get more information on drinking water, on lead in water, and on lead ingeneral

3.2.2 Outreach to New Customers

The LCRWG recommends that a revised LCR require PWSs to provide information to all[6] new customers in a letter or via other direct means on the potential risks of lead in drinking water.

The outreach materials should include information about the potential for lead from plumbing materials to contaminate drinking water even when a PWS meets the LCR LAL, to contaminate drinking water in homes with and without LSLs, and to pose chronic and acute health risks to vulnerable populations. The specific information to be covered in those materials could be included in the consultation with the diverse group of experts as described in the introduction to Section 3.2 above and in Section 4 below. Although the LCRWG defers to such a group, it suggests that at a minimum the following topics be covered:

1. Information about lead in drinking water (its sources, variable and erratic release, and wide range of lead concentrations)
2. Information about the health effects of lead in drinking water (including chronic and acute health risks)
3. Information about the LCR's shared responsibility regime
4. Actions the PWS is taking to minimize lead in drinking water
    - PWSs with LSLs would mention their proactive LSL replacement program
5. Steps consumers can take to reduce exposure to lead in drinking water
    - In addition to a list of actions like the ones mentioned in the current Rule, PWSs with LSLs would spell out how consumers in homes with a LSL can participate in their proactive LSL replacement program
6. Phone numbers and online links for additional information (including a link to EPA's online National Clearinghouse)

The outreach to new customers should be delivered within 30 days or with the first bill.

3.2.3 Revise the Current CCR Language

The CCR is a necessary but not sufficient source of information for the public. It can provide general information, but is not designed to be frequent or detailed enough for all public education purposes.

All community water systems (CWSs) should continue to include a statement about lead in their CCR. There may be circumstances (e.g. a subdivision built entirely after January 2014 when "lead-free" requirements came into effect), where a CWS can demonstrate that there are no lead-bearing materials in contact with drinking water. EPA may want to consider allowing the primacy agency to waive this CCR language requirement if an entire CWS can meet this criterion.

[6] EPA may wish to consider circumstances under which exceptions might be applicable.

The LCRWG recommends that the CCR language should be strengthened to include:

- Public health statements updated to reflect current understandings that there is no safe level of lead and a summary of the health effects, that this risk pertains to everyone, and that some individuals are particularly vulnerable;
- A link to the national clearinghouse should be added to the CCR for all CWSs;
- Recognition that a CWS's compliance with federal regulations does not guarantee what level of lead (lower or higher) might be found at the tap in a particular home; and
- The message that customers play an important role in protecting themselves from exposure to lead.

In addition, the work group recommends that PWSs where full or partial lead service lines exist(or are presumed to exist until an inventory demonstrates otherwise) also add information about what a lead service line is and how to contact the utility for information about how to find out if you have one and why you should replace it.

Further, the LCRWG recommends that the following redraft of the CCR be considered as a starting point for incorporating the elements listed above, to be reviewed by the diverse group of experts that the LCRWG suggests EPA consult .

> ***Important Information from EPA about Lead*** *If lead is present in your drinking water, it ~~elevated levels of~~ can cause serious health problems, especially for pregnant women and young children. Lead can affect children's brains and developing nervous systems, causing reduced IQ, learning disabilities and behavioral problems. Lead is also harmful to adults. Lead in drinking water is primarily from materials and components associated with ~~service lines and~~ home plumbing and service lines (the pipe connecting your home to the water main). ~~(System name) is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components.~~ Contact us for information about lead service lines, how to find out if you have one and why you should replace it. [Last sentence for systems with LSLs.]*
>
> *~~When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking.~~ Protecting you against exposure to lead is a shared responsibility. Your water utility is required to minimize the corrosivity of the water. However, because every home is different, the amount of lead in your tap water may be lower or higher than the monitoring results for your public water system as a whole. You can take responsibility for identifying and removing lead materials within your home plumbing and taking steps to reduce your family's risk. If you have lead service lines or lead-bearing materials in your home, ~~are concerned about lead in your water,~~ you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at 1-800-426-4791 or www.epa.gov/safewater/lead. [Insert new national web site link]*

3.2.4 Strengthen Requirements for Public Access to Information

The LCRWG supports the public's right to know about the quality of their water and considered various options to increase the public's access to data related to lead and copper.

Under the current rule, the PWS is only required to make publicly available through the Consumer Confidence Report (CCR) that the "90th percentile value of the most recent round of sampling and the number of sampling sites exceeding the action level." 40 CFR 141.153. In many jurisdictions, a

concerned consumer may be able to obtain or view a redacted version of the complete sampling data set but this approach is time-consuming and burdensome on the PWS (or the state) and the community. EPA receives only a summary of the sampling results.

As the LCRWG evaluated different approaches, we kept in mind EPA's Office of Enforcement and Compliance Assurance (OECA) five principles for highly effective regulations and that OECA is working with regulatory programs to evaluate new and revised rules against these principles. Principle 4 calls for rules to "leverage accountability and transparency by providing the government and the public with real-time access to quality information on regulated entities" emissions, discharges and key compliance activities and outcomes." OECA identified two tools to accomplish this:

- Electronic reporting to the government.
- Public accountability via websites, paper/electronic mailings, and other ways to provide the public and stakeholders (e.g., customers, ratepayers) with compliance information.

The LCRWG encourages EPA to use the SDWIS-Prime data system[7] that is under development to meet the first provision of the above goal. Electronic reporting from utilities to a centralized data system would allow the public to access data from the State or EPA in a coordinated manner and allow for consistent access to all water quality data, not just data for lead and copper.

Until such time as the new data system is in place, though, the LCRWG believes that water systems should increase the availability of data to the public. This would include:

- The number of samples over the Household Action Level (described in Section 3.5 below) in the last monitoring period, the highest level found during the last monitoring period, the median levels, and the most recent 90th percentile level compared to the "system action level" (renamed from the current action level).
- Requiring water systems to include WQP-related information on their webpage, or in the CCR or some equally accessible manner (e.g., CCT treatment, approved WQP ranges, WQP results from the last monitoring period)
- Encouraging water systems to post additional information on their webpages such as:
    - Public education materials (and link to National Clearinghouse).
    - Sampling protocols the water system provides to customers to use when collecting lead samples and any variations from EPA recommendations.
    - Individual sampling results (with appropriate privacy provisions such as address redaction).
    - Inventory (such as a map) of confirmed and presumed lead service lines.

Where a community has lead service lines, EPA should require PWSs provide a public statement of lead service line ownership and the legal basis of said determination. (See section 3.1.2, point 5 *"Control and Responsibility."*)

[7] SDWIS is a database for storage about drinking water systems. The federal version (SDWIS/FED) stores the information EPA needs to monitor approximately 156,000 public water systems. The state version (SDWIS/STATE) is a database designed to help states run their drinking water programs. SDWIS-Prime is an upcoming version of this program. The website for SDWIS is located here:
http://water.epa.gov/scitech/datait/databases/drink/sdwisfed/index.cfm
SDWIS Reports:
http://water.epa.gov/scitech/datait/databases/drink/sdwisfed/howtoaccessdata.cfm

3.2.5 Routine Outreach to Caregivers/Health Care Providers of Vulnerable Populations

The LCRWG recommends that a revised LCR encourage PWSs to cooperate in locally appropriate public education programs targeted at caregivers and health providers of the populations most vulnerable to lead in drinking water (i.e., pregnant women, infants, young children, and children with elevated BLLs). The intent of such outreach is to raise awareness among caregivers and health providers about the health risks of lead in drinking water, easy steps to prevent exposure, and the availability of EPA's online National Clearinghouse for further information. It is expected that public education messaging in service areas with LSLs will differ from public education messaging in service areas without such lines.

In conducting outreach to caregivers and health care providers it is important that the message be provided by an organization or individual that carries credibility with those audiences. The LCRWG suggests the way to best ensure that caregivers and health providers hear and respond appropriately to information about lead and drinking water is for water suppliers to participate in joint communication efforts, lead by state health departments, state lead poisoning prevention agencies, and state drinking water primacy agencies. This outreach should be targeted to individuals, organizations and facilities likely to be visited by the vulnerable populations of pregnant women, infants, and young children, such as:

1. local public health agencies;
2. public and private pre-schools, schools;
3. Women Infants and Children (WIC) and Head Start programs;
4. public and private hospitals and medical clinics;
5. pediatricians, obstetricians-gynecologists, and midwives;
6. family planning clinics;
7. local welfare agencies; or
8. licensed childcare centers.

1. The outreach efforts should make use of the information provided in the clearinghouse

Examples of communication vehicles that might be suggested in guidance materials include:

- Development and routine delivery of a joint communication from the PWS (or a group of PWSs) and the City/State to:
  - Health providers (e.g., OBGYNs, pediatricians, midwives)
  - Childhood lead poisoning prevention professionals/organizations
  - Professionals at licensed daycare centers and schools
  - Listservs/organizations for pregnant women/parents of infants (e.g., local listservs, environmental health groups, La Leche League, etc.)
- Delivery of educational materials during any water-related work at customer homes
- When lead-in-water levels at individual homes test above the HAL, delivery of information to a) the residents at the home and b) City/State health departments. These materials ought to cover information prescribed in the current LCR for public outreach during a LAL exceedance as well as:
  - The lead level detected at the specific home
  - What this level means in terms of health risk to vulnerable individuals
  - If the PWS determines that the home has a LSL, information about how to participate in the PWS's proactive, full LSL replacement program.

The LCRWG also recommends that EPA, informed by the advice of the diverse group of experts described above and working with CDC, HHS and HUD, develop guidance (and make it available through the National Clearinghouse) on how to develop and deliver effective communication efforts to caregivers and health care providers focusing on ways those individuals and groups can reach pregnant women, parents of infants and young children and those who care for them. The audience for those materials would be state primacy agencies, state or local health departments, and state or local lead poisoning prevention agencies, as well as PWSs.

To support PWSs in the development of feasible, locally appropriate, and successful public outreach programs targeting vulnerable groups on a routine basis, the LCRWG recommends the following: that the diverse group of experts EPA may convene for the development of consumer-centered public education messaging and materials (see introduction to Section 3.2), also develop guidelines and best practices that PWSs can use to create proactive risk communication programs. Echoing extant principles and understandings of effective risk communication,[8] we imagine such programs to involve robust collaboration between PWSs, many of the local public health agencies and organizations listed above, as well as local childhood lead poisoning prevention groups (State-funded and grassroots), environmental health organizations, and key community leaders (e.g., advisory neighborhood commissioners).

Education of public health and health care providers on lead and water issues

The LCRWG had extensive discussions about the frustration that members of the group had that many in the public health community minimized the risk of lead exposure from drinking water, placeda lower priority on actions to reduce that risk, and frequently provided incomplete or conflicting information to members of the public or patients. This made and continues to make the work of water professionals in motivating appropriate action by customers more difficult. Those in the health sector are highly regarded, and viewed as knowledgeable about all health related topics. Customers will look to them for advice and to validate what they hear from their water provider. Efforts by water systems to reach out to their customers must be appropriately re-enforced by those in the health sector if those efforts are to be successful.

The LCRWG recommends that EPA, CDC, HHS and HUD conduct training and outreach to local health agencies, medical professionals and local and state lead poisoning prevention agencies on:

1. Information about lead in drinking water (its sources, variable and erratic release, and wide range of lead concentrations)

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[8] Lundgren, R. E. and A. H. McMakin. 2013. *Risk Communication: A Handbook for Communicating Environmental, Safety, and Health Risks*. Hoboken, NJ: John Wiley & Sons, Inc.
Risk Communication in Action, http://nepis.epa.gov/Adobe/PDF/60000I2U.pdf
Communicating about Lead Service Lines,
http://www.awwa.org/Portals/0/files/resources/publicaffairs/pdfs/FINALeadServiceLineCommGuide.pdf
Strategies to Obtain Customer Acceptance of Complete Lead Service Line Replacement,
http://www.awwa.org/Portals/0/files/legreg/documents/StrategiesforLSLs.pdf
National Conversation on Public Health and Chemical Exposures: Education and Communication Work Group Report, http://www.utmb.edu/cet/downloads/Natl_Conv_Edu_Comm_WorkGroup%20Report.pdf
Advancing Collaborations for Water-Related Health Risk Communication,
http://www.waterrf.org/PublicReportLibrary/91145.pdf

2. Information about exposures routes of lead in drinking water to different vulnerable populations, including pregnant women, infants and young children
3. Information about lead service lines
4. Information about the LCR's shared responsibility regime between water system and customer
5. Actions that PWSs typically take to minimize lead in drinking water
6. Steps consumers can take to reduce exposure to lead in drinking water, including removal of LSLs
7. Phone numbers and online links for additional information (including a link to EPA's online National Clearinghouse)

The LCRWG also recommends that EPA work with CDC to incorporate in the CDC's website, educational materials, and materials used by CDC-funded childhood lead poisoning prevention programs nationwide, accurate and up-to-date information about lead in drinking water (its sources, variable and erratic release, wide range of lead concentrations, chronic and acute health risks, the LCR's shared responsibility regime, steps to prevent exposure).

3.2.6 Public Education Compliance

3.2.6.a Compliance for New Customer Outreach

Violations:

- Failure to provide information to new customers

3.2.6.b Compliance for CCR

Recordkeeping, reporting and violations: Same as in the current CCR rule, with updated content.

3.2.6.c PE Compliance for Public Access to Information

PWS must provide the public access to information about:

- Number of samples over the Household Action Level, median, 90th percentile, and highest level found in the last monitoring period
- CCT treatment, approved WQP ranges and WQP results from the last monitoring period

Violations:

- Failure to make this information available to the public

3.3 Improve Corrosion Control

Corrosion Control Treatment (CCT) involves the addition of chemicals (e.g. orthophosphates or silicate) to create a barrier between the pipes and the drinking water, or to modify drinking water chemistry (such as pH and hardness) to inhibit the potential for corrosion. The concept is to manage the treatment system to reduce corrosion (and, thus, the release of metals such as lead and copper) from the distribution system and premise plumbing.

Under the current LCR, PWSs serving more than 50,000 people were required to work with their primacy agency (typically the state) from 1994 to 1997 to designate and install optimal corrosion control treatment. Systems serving 50,000 people or less must optimize corrosion control treatment only if the

results of lead and copper tap sample exceed the action levels. A PWS exceeds the lead AL if ten percent or more of the tap samples collected are greater than the 15 ppb action level.

In evaluating CCT choices, a PWS must consider list of assessment parameters; and, as part of the approval of a PWS CCT plan, the state also approves a shorter list of process control parameters applicable to that system to demonstrate that the selected treatment is being properly operated over time. For purposes of this report, the term water quality parameters (WQPs) applies to these latter process control measures. Recommendations concerning WQPs are included in Section 3.4.

Based on the experience with current LCR requirements provided to this work group and shared by work group members, the LCRWG has concluded the following:

- CCT remains an important component of the LCR, in that it is intended to achieve a water quality that minimizes dissolution of lead and copper in water.
- Effective CCT varies based on the specific conditions from system to system. Increased knowledge about CCT since promulgation of the current LCR, if applied today, could lead to improvements in CCT in some systems. Thus, PWSs and their primacy agency should apply the most current science, tailored to the unique circumstances of each system, to the choice of treatment plan and its associated water quality parameters. A variety of factors affect the dissolution of lead in water, including but not limited to pH and alkalinity. Factors other than the stability of designated WQPs can include, among others, the formation/dissolution of protective scales; the presence of manganese, iron, chlorides, sulfates, aluminum and other materials; and temperature. Variations in water quality also can occur within the distribution system. These water quality conditions vary among PWSs, which in turn affect the CCT choices a PWS must make in the context of other regulatory requirements.
- Lead also occurs in different forms in plumbing systems, from soluble to insoluble and particulate in nature. Sources of lead vary from the very common leaded solder and brass fixtures/valves, to LSLs, and to less common lead-lined iron pipe. CCT is more effective in reducing exposure to soluble lead than it is for particulate lead, although CCT that contributes to the formation of certain scales may also provide benefits in reducing exposure to particulates. Thus, while very important, CCT is not the only lead control mechanism that a PWS must have in place. In other words, CCT should not be relied upon by itself to control lead in water. Rather, it should be one of a tool box of other required mechanisms depending on a PWS's particular conditions and lead sources (e.g. LSLs, leaded solder, leaded brass, etc.). These tools are described in other sections of this report and include: LSL replacement (as well as the replacement of other less common sources of lead such as lead-lined iron pipe), current and future use of lead-free materials, stronger public education including targeted public education to vulnerable populations (pregnant women and families with infants and young children), availability of certified POU filters, instructions on how to flush plumbing systems when lead could be disturbed, etc.

3.3.1 Corrosion Control Recommendations

The LCRWG recommends that:

- EPA release a revised CCT guidance manual as soon as possible and update this manual every six years, so that PWSs and primacy agencies can take advantage of improvements in the science;
- EPA provide increased expert assistance on CCT to PWSs and primacy agencies;
- The LCR continue to require re-evaluation of CCT when a PWS makes a change in treatment or source water;

- The LCR continue to require WQP monitoring to ensure that the CCT is achieving the treatment objectives and that EPA consider requiring such monitoring on a more frequent basis with additional guidance on process control methods; and
- Large systems review their existing CCT plan in light of current science in a newly revised guidance manual with their primacy agency to determine whether the WQPs reflect the best available current science. The LCRWG suggests that this review be done every six years following EPA's six year rule review cycle, and subject to there being sufficient science change that EPA updated the guidance manual. EPA should plan to review and refresh Agency guidance every 6 years, subject to significant improvement in the state of knowledge, to allow research to inform rule implementation. In addition, regularly revised guidance would help states and systems stay current with corrosion control science as they respond to problem situations, but more importantly help them anticipate challenges as new water sources and treatments are brought on line, or they contemplate further refinement to corrosion control. Small and medium sized systems should work with their primacy agency to determine whether updates to CCT guidance is applicable to them.

3.3.2 Corrosion Control Compliance

PWS must maintain records that it reviewed new EPA guidance manuals and assessed whether and, if so, what changes to CCT are applicable, based on the current state of the science.

Violations:
- Failure to notify and consult with primacy agency on re-evaluating CCT if the PWS makes a change in treatment or source water
- Failure to review CCT when EPA updates the guidance manual (for large systems)
- Failure to act if state notifies them that they should assess CCT or make adjustments, based on state review of guidance manual (for medium and small systems)

3.4 Modify Monitoring Requirements

Under the current LCR, a PWS is required to conduct monitoring to assess the effectiveness of its corrosion control treatment (CCT) and trigger additional actions to reduce exposure when necessary. Water systems must compare sampling results to an Action Level (AL). The AL for lead is 15 µg/L and the AL for copper is 1.3 mg/L. In the Lead and Copper Rule (LCR), water systems must prioritize sample site locations (often residences) within the distribution system which are at a high-risk of elevated lead and/or copper in the water. Selection and use of these elevated lead and copper sites enables a smaller number of sample sites than random or geographic site selection procedures.

Implementation of this approach over time has revealed numerous challenges. Recruitment of customers to take in-home samples can be difficult and costly. Customers are not professional samplers and, thus, may implement the sampling protocols inconsistently. Research on sampling protocols also has shown that sampling results may vary, and not necessarily consistently, based on the configuration and length of lines from the water main to the sampling tap and whether the sample is a first draw or a subsequent sample intended to reflect water that had been in a LSL for some time.

The LCRWG recommends two types of on-going monitoring: 1) a more robust WQP monitoring program to improve process controls for CCT, and 2) voluntary customer initiated tap water sampling coupled with a more robust and targeted public education program to encourage sampling, in part to provide direct

information to consumers that they can use to reduce potential exposures to lead from drinking water in their home and to provide ongoing information to the PWS to identify and correct unanticipated problems.

The LCRWG also recommends that EPA establish criteria for a PWS to transition from the current rule framework into the new rule framework. The LCRWG recommends that the transition includes a condition that a PWS must comply with the requirements of the current LCR until the PWS has achieved three rounds of monitoring results under the lead AL using the current LCR requirements. Results from past rounds of monitoring can be used or new data will be required if prior data are above the AL. At that point, the PWS can define their CCT or WQPs for the new rule as that which was used to achieve this record. The existing lead AL should be redefined as a System Action Level in the new rule wherein it will be used when determining re-optimization, e.g. for use during a review of a new source or treatment, if the state determines that additional utility tap sampling is warranted. In other words, it will provide a baseline target for confirming CCT if lead sampling is chosen as one means by which to determine CCT. PWSs must continue to demonstrate that they are maintaining the WQPs used to establish the transitions. All systems, regardless of their lead AL status, should be required to transition to the new LSL replacement program and public education program requirements of the revised LCR as of the effective date of the new rule.

3.4.1 Water Quality Parameter Monitoring

As noted above, WQP monitoring is distinguished from the more extensive list of parameters that a water system would consider as it evaluates corrosion control technology choices. WQPs for the purpose of this section involve the on-going process control monitoring that demonstrates that the selected treatment is being properly operated over time.

The WQP program recommended below builds on what is in the current rule by recommending:

1) more frequent monitoring than currently required and monitoring that is representative of the distribution system (e.g. at points currently used for DBP monitoring or at a subset of points used for TCR monitoring) to capture currently undetected variability;
2) continuing to tailor WQPs to the individual PWS CCT plan and asking EPA to review and consider adding to the list of WQPs referenced in the LCR, based on EPA's anticipated revision to the CCT guidance manual;
3) that WQP monitoring be periodically revisited based on the advancing science as documented in research reports and disseminated through periodically revised EPA guidance manuals; and
4) that a more rigorous data review process such as control charting and similar process control techniques be used to take advantage of the collected data to improve the consistency of operation, encourage fine-tuning of processes, reduce variability of water quality within the distribution system and detect and manage excursions.

In addition, these data should be reviewed whenever there is a change in source or treatment (see 4.3 above); and, when a system or state primacy agency sees significant changes in WQP data, it should initiate a "find and fix" process, looking for what changed and why, and requiring the PWS make any needed adjustments or corrections. This provides one type of reality check and correction not explicitly in the current LCR.

In addition, the LCRWG recommends that systems which are not currently practicing CCT under the LCR but have been under the lead action level by virtue of either naturally non-aggressive source water or by virtue of other aspects of treatment in use, be required to conduct a WQP monitoring program to

continue to demonstrate that the characteristics which caused them to be non-corrosive are continuing to be in place.

3.4.2 Tap Sampling for Lead

The LCRWG also recommends that a voluntary customer-initiated sampling program based on the more robust and targeted public education efforts being recommended elsewhere in this report be substituted for the current LCR tap sampling requirements. .

The results of the voluntary tap sampling program will be used for three separate purposes:

- informing and empowering individual households to take action to reduce risk,
- reporting to health officials when monitoring results exceed a "household action level" (see section 3.5) and
- ongoing information to the utility to assess effectiveness of CCT.

Information for Households

Data from customer-initiated sampling will be valuable in informing and empowering individual households and thus provide greater customer service. All data provided to customers would need to include appropriate information about the variability of lead levels, that a single sample does notrepresent all water quality, and that levels at a particular tap at a particular time might be higher or lower. The transmittal should also provide appropriate information about the risks of lead exposure, sensitive populations, and actions the consumer can take to minimize risk.

This type of sampling is currently discouraged by the current rule because water systems are often concerned that "complaint" or "customer " samples would be included into the required 90th percentile calculation with potential mandatory response actions if it exceeded the action level. This resulted in system not offering sampling or having the samples be analyzed through a private lab (and therefore the data would not be available for any utility management or regulatory purpose). Currently, PWSs are mandated to return to the same locations which, while it may have value for other reasons, means that many other households do not get the opportunity to understand their lead exposure. Voluntary customer-initiated sampling can also capture data from multi-family residences, which is not included in the mandatory LCR sampling in most cases. A new approach could achieve greater customer service and more data to understand and manage lead corrosion.

Outreach to encourage customers to sample will likely involve many different customer contact opportunities including the CCR, outreach related to having a LSL, outreach related to construction contracts, new customer contact, community meetings, other educational outreach efforts, and whenever a customer contacts the CWS for a water quality question or complaint.

Customers should be given the opportunity to determine the type of information they are interested in, thus should be offered a menu of sampling protocols, e,g. a random daytime sample to determine typical exposure levels, first draw to determine the effects of a brass faucet, or a timed or temperature determined sample from within a service line. The National Clearinghouse should include templates with instructions for each type of sample.

Information for Public Health Officials

Data from customer samples which exceeded the "household action level" recommended in section 3.5, would be required to be forwarded to health officials. While LCR tap water results are currently provided to the collecting household, the LCR does not require any action for individual high samples, and there is

no mandate to refer to health authorities. While the LCR cannot guarantee actions by health departments, this recommendation provides direct health intervention in those cases where sampling indicates high lead levels.

Information for Assessing the Effectiveness of CCT

The third use of the customer tap sampling data is to provide on-going information to the utility of potential changes in the effectiveness of CCT. Under the current rule, most systems are sampling for one four-month period every three years. Any changes or variability in lead levels at the tap during the other 32 months of that period are missed. Under this proposal, it is anticipated that there would be a more regular stream of data from more locations, providing information which can be used to understand system performance. The data would be provided to the state primacy agency and presented as time series data to facilitate identifying any changes in the data over time. Small systems might report the data on something as simple as a spreadsheet chart, while larger systems might use more sophisticated analytical methods to understand and use the data.

Unexpected or unexplained changes in the tap sampling data can be used in a "find and fix" approach to identify and respond to potential problems. This could be system initiated or in response to periodic review of the system data by the primacy agency, such as during a sanitary survey. This provides a reality check on whether something unexpected is happening within the distribution system, even though consistent treatment was maintained. The more robust (in both temporal and geographic distribution) of the customer sample data set provides a more powerful check on treatment than the current episodic sampling does.

Specifically the LCRWG recommends that the revised rule require that:

- any customer sampling data be reported to the state on a routine basis and include which of the menu of sampling protocols referenced above was used;
- data be provided as soon as possible and no later than within 30 days to the customer and, if over the household action level, to the health department (as discussed above and in section 3.5);
- the PWS maintain the data set for analysis and review, taking type and location of each sample into consideration, to identify trends and changes in the data;
- the data be available for public review as described in section 3.2.4;
- the PWS and the state review the data and trend analysis during sanitary surveys;
- annually, at the discretion of the primacy agency, the PWS provide the primacy agency with a data summary report of the three most recent years of all tap sampling data, the specific details of which should be determined by EPA;
- if the three most recent years of customer sampling data show that the 90th percentile (running three-year calculation) is above the System Action Level, then the PWS must analyze any changes or trends in the data to evaluate whether they are based on system-wide, local , or household-based conditions, and provide the report and analysis to the state for their review and determination if additional analysis, re-evaluation of CCT, or other actions such as household-based actions (LSL removal, education about lead-free faucets and flushing after non-use of water, etc.) are appropriate.
- if the system makes any source or treatment changes, the PWS and state should use the customer sampling data in the consultation, review and approval by the State currently required by the LCR.

The LCRWG also recommends that EPA provide guidance to states and PWSs on additional forms and types of data analyses which can be conducted on sampling data to provide more detailed understanding

of trends and to support system decision making on customer actions, treatment evaluations or development of system plans and priorities for LSL replacement programs.

It seems appropriate to include some sort of floor to the number of customer samples. Some members of the group suggested that systems should be required to collect no fewer samples in a three year period than they would under the current three-year reduced monitoring requirement.

When a system changes its source or treatment, and is required to consult with the state, the state primacy agency also may choose to require additional one-time monitoring to evaluate those changes if the degree of the change warrants.

Some members suggested that some small systems might want the opportunity to maintain the current home tap water monitoring program. The revised LCR should allow this, while not discouraging customer sampling.

3.4.3 Sample Invalidation Criteria

Under the existing regulation (141.86 (f)(1)), "The State may invalidate a lead or copper tap water sample if at least one of the following conditions is met.

(i) The laboratory establishes that improper sample analysis caused erroneous results.
(ii) The State determines that the sample was taken from a site that did not meet the site selection criteria of this section.
(iii) The sample container was damaged in transit.
(iv) There is substantial reason to believe that the sample was subject to tampering."

These are all good and necessary reasons for invalidating a sample and should be retained, but because this list is limited, samples must be accepted that are obvious "outliers" and don't represent the water that is normally consumed and should not be used as a basis for treatment changes or public education. This is especially true for small systems where the limited number of samples required means that a single, unusually high, value can cause the Action Level to be exceeded. This could lead to installation of expensive treatment when treatment is not needed or adequate corrosion control is already being provided. While probably not as frequent, non-representative samples could also cause water systems to be below the action level when treatment changes really are needed. Good invalidation criteria can help states address both problems.

The purpose of the invalidation is to make sure that decisions are based on the most representative set of samples possible and to do so through a process that provides adequate information to make good invalidation decisions and assures documentation of the reasoning behind the invalidation.

The following is a proposal from states that will serve those two functions.

States believe that the essential criteria for invalidation are already well stated in the Revised LCR Monitoring and Reporting Guidance (EPA 816-R-10-004, March 2010) or the October 2006 memorandum on Management of Aerators During Collection of Tap Samples to Comply with the Lead and Copper Rule. The LCRWG recommends that EPA take the following into account when revising the proposed rule and expand the invalidation criteria accordingly:

- Make sure the sample is taken at a tap that is used regularly, and not an abandoned or infrequently used tap."
- "If first-draw samples are collected at single-family residences, the sample must always be drawn from the cold-water kitchen tap or bathroom tap."

- "If first-draw samples are collected from buildings other than single-family homes, the sample must always be drawn from an interior tap from which water is typically taken for consumption."
- "Public water systems should not recommend that customers remove or clean aerators prior to or during the collection of tap samples for lead."

3.4.4. Monitoring Compliance

PWS must monitor and report based on water quality parameters and schedule set by state primacy agency, and use the data for on-going treatment process control (3.4.1)

Violations:
- Failure to monitor as per schedule
- Failure to maintain data, and use in process monitoring (to be evaluated by state during sanitary survey inspections or as state primacy agency requests)
- Failure to report data to state
- Monitoring results outside the WQP range established in the PWSs CCT plan along lines similar to current rule requirements

PWS also must include an offer to customers in all LCR related outreach to collect a sample, including in all LSL outreach efforts. PWS must also:
- collect sufficient number of samples, either by customer request or utility initiated sampling, i.e. no fewer samples in a three year period than under the current three-year reduced monitoring requirement, assuming the PWS qualifies for such reduced monitoring;
- promptly report the data to the customer, the state and local PH (if above health action level); and
- use the data as part of on-going evaluation of CCT performance, monitoring for changes in lead levels at the tap over time, geographic trends in levels, and interaction with distribution system water quality.

Violations:
- Failure to offer to sample
- Failure to collect minimum number of required samples within 3-year window
- Failure to report data to:
  - Household
  - State
  - Local public health agency (if above household action level) no later than 30 days after the result was received
- Failure to provide rule-required information in sampling offer materials, or in household reporting of the data
- Failure to use household tap sampling data in on-going evaluation of CCT and maintain record of having done so, (as determined by state during sanitary survey inspections or as state primacy agency requests)

3.5 Establish a Household Action Level

The current lead action level is based on the 90th percentile of the collected samples. Without a maximum limit, some users may be exposed to levels of lead in the drinking water that presents a potentially significant health threat, especially to children, without exceeding the action level.[9] If the levels are high enough and state and local authorities do not act, EPA could determine that the levels pose "an imminent and substantial endangerment to the health of persons" pursuant to section 1431 of the Safe Drinking Water Act. (40 USC 300i)

3.5.1 Household Action Level Recommendations

To avoid the possible need to invoke section 1431 of the SDWA, the LCRWG recommends that EPA establish in a revised rule a "household action level" and require the PWS to notify the local health department and state drinking water authority of sample results over that level. The requirement would be triggered by any sample results that the PWS receives from a user or from its own monitoring. However, the PWS would not be required to make the notification until it has investigated the sample in a timely manner to eliminate sampling or assay errors.

The existing rule already requires the PWS to notify residents of the results of water system conducted lead sampling. We would anticipate that the PWS would alert the resident to possibility that the health department may be notified when the sample was taken or the resident provided the PWS with the sample results. While this notice may have the unintended consequence of discouraging some customers from testing, it is important for the customer to make an informed choice.

In response to the notification, the PWS and the health department would consider the situation and take action that they deem appropriate (e.g., testing children's blood, recommending a filter, discussing lead service line replacement with the resident or landlord, advising grandparents about risk to visiting children, or continuing to monitor the situation). We anticipate that the health department be the lead agency, and that the rule would not prescribe actions other than notice as the situations are too diverse and complicated for prescription actions. The LCRWG encourages EPA to work with the Centers for Disease Control and Prevention on recommended approaches and make this information available through the clearinghouse discussed in section 4.2.

This requirement would be somewhat similar to the regulatory approach taken by the Department of Housing and Urban Development which mandates that public housing authorities notify the local health department within five days when it receives information from any source that a child of less than six years of age living in an assisted dwelling unit may have an environmental intervention blood lead level. (24 CFR 35.1225)

[9] The LCRWG discussed the relationship between the household action level and the current lead AL (to be renamed the system action level). These levels have two distinct purposes. The LCRWG assumed during its discussions that the household action level would be significantly greater than the system action level. It recognized, therefore that, depending on what level is set, the household action level may have impacts on other recommendations in this report.

We recommend that EPA set the household action level based on the amount it would take for an infant to have a blood lead level greater than five micrograms per deciliter (µg/dL) based on consumption by an average, healthy infant of infant formula made with water. When a child's blood lead level exceeds five µg/dL, the Centers for Disease Control and Prevention (CDC) recommends that laboratories and health care providers notify local and state health departments and that action be taken to identify and prevent further exposure.[10]

3.5.2 Household Action Level Compliance

If household sample exceeds the household action level, PWS must promptly notify the household and the local public health agency; certify that this has been done, and maintain records of having done so.

Violations:

- Failure to report data no later than 30 days after the result was received, to
  - Household
  - Local public health agency
- Failure to certify to state that data was reported to the household and to the local public health agency within 30 days
- Failure to maintain records of correspondence between PWS and the local public health agency,

3.6 Establish Separate Monitoring Requirements for Copper

The current LCR does not deal effectively with copper. Generally speaking, the current rule focuses on the health benefits associated with lead risk reduction, with the result that the currently required in-home sampling is often done in locations with old copper that has passivated. Thus, the possibility may be missed that a system's water chemistry could result in copper releases. Further, the current rule does not require public education for copper, which can have broad benefits.

The LCRWG has concluded that the regulatory approach should separate lead and copper risk management, refocusing attention to where there may be a problem with copper without increasing the burden on systems where there is not a problem. This can be achieved in a cost effective manner by targeting copper monitoring requirements to those PWSs where there may be exposures.[11]

Elevated exposures to copper generally result from new copper plumbing[12] where water chemistry is aggressive to copper. It is technically possible to identify water chemistries that are aggressive versus not aggressive to copper. Thus, the LCRWG recommends that the requirements for copper monitoring focus first on sampling for basic finished water quality parameters such as pH, alkalinity, and orthophosphate in a way that is representative of the distribution system to identify waters that are aggressive to copper. Systems that can demonstrate that their finished waters are not aggressive to copper or that their

[10] http://www.cdc.gov/nceh/lead/ACCLPP/blood_lead_levels.htm

[11] The LCRWG recommends this approach, assuming EPA determines that the health benefits of regulating copper justify the costs. A full health risk assessment for copper was beyond the scope of the LCRWG's charge, however; and, thus, EPA's analysis of whether benefits justify the costs may have implications for these recommendations.

[12] New copper is generally understood to be between six months to three years of use.

distribution systems contain no copper should have no further copper monitoring requirements. This could be written into the rule, rather than require a monitoring "waiver."

3.6.1 Copper Recommendations

Further, the LCRWG recommends that the LCR be revised based on the following concepts:

1. Instead of basing action on the results of routine, in-home copper sampling, actions should be based on the aggressiveness of the water to copper. Systems can determine if their water is aggressive to copper by doing WQP monitoring in the distribution system. All PWSs should be assumed to have water that is aggressive to copper unless they demonstrate that it isn't.

2. EPA should develop criteria to define water that is not aggressive to copper for the purpose of establishing whether a system falls into that category (or "bin") for the purposes of the LCR. EPA should consider the accuracy and potential variability of pH and alkalinity monitoring as well as corrosivity to copper in establishing pH and alkalinity ranges. The criteria also should include consideration of passivation time. Examples of bins (for verification by EPA) would be:

    a. if alkalinity is < 35 pH must be > 7.0 (no upper pH limit)
    b. if alkalinity is 36 to 100, pH must be > 7.2
    c. if alkalinity is 101 to 150 , pH must be > 7.5
    d. if alkalinity is 151-250 , pH must be > 8

If orthophosphate is used, examples of bins would be:

    a. if alkalinity <150, PO4 must be >1 mg/L
    b. if alkalinity is 150 to 200, PO4 must be > 2 mg/L
    c. if alkalinity is 200 to 240, PO4 must be > 3 mg/L
    d. if alkalinity is greater than 240, PO4 must be > 3.3 mg/L

3. PWSs can choose one of several approaches to demonstrate that their water is not aggressive to copper:

    a. Conduct water quality parameter monitoring to assess whether their water meets the definition established by EPA.

    b. Conduct a one-time evaluation with copper sampling at vulnerable houses (houses < 2 years old with new copper plumbing) to demonstrate that water chemistry is non-aggressive (copper levels fall under the AL/SMCL). EPA may want to consider:

        i. Limited number of sample sites needed given copper chemistry

        ii. Provision for sample invalidation based on site-specific conditions such as biologically-induced corrosion.

    c. Conduct a pipe loop study to demonstrate the water chemistry is non-aggressive

    d. Change water chemistry to within the range established for non-aggressive water quality

4. PWSs with water **classified as non-aggressive to copper** must continue to demonstrate that the water is non-aggressive. PWS's can choose to:

    a. Maintain those WQPs that demonstrate it maintains non-aggressive water under (2) above, or

b. Conduct copper sampling at vulnerable houses (houses < 2 years old with new copper plumbing) to demonstrate that water chemistry is non-aggressive (copper levels fall under the AL/SMCL)

PWSs that are not able to maintain their WQPs must implement a public education program as described in the next section.

5. PWS's with water **classified as aggressive to copper** must initiate and maintain a public education program. The public education program must either provide:

   a. Information to all new homes (new construction or change of service) upon initiation of new service

      AND

   b.
      i. Information to newly renovated homes at time of renovation

      OR

      ii. Information to all customers on a routine basis

   In addition, in guidance, EPA should encourage PWSs to notify contractors, plumbing suppliers, and plumbers of copper corrosivity and to work with relevant officials and organizations to consider building and plumbing code changes that would prohibit copper piping in new construction if the corrosive water conditions cannot be eliminated. EPA also should provide guidance and/or templates, particularly for small systems, for public education messages and modes of delivery.

6. EPA should consider whether or under what circumstances CCT should be required for a PWS **classified as aggressive to copper** Not all systems with water aggressive to copper necessarily will have homes with new copper, so treatment might not be necessary or perhaps even advisable, particularly for small systems that can control plumbing materials used or for systems in communities that modify their plumbing codes. Passivation time of copper varies considerably, and CCT may not be necessary or advisable when passivation time is short if interim actions to protect public health other than CCT are feasible. In determining when CCT should be required and any associated monitoring requirements, EPA also should take into consideration that a PWS may not have access to information about renovations where new copper has been installed and, even when such information is available, can't control whether the customer will participate in a monitoring program. Setting the correct level and establishing a regulatory approach that triggers CCT only when necessary will require a complex assessment and is beyond the scope of this workgroup.

7. In the revised LCR, systems should continue to be required to notify the primacy agency if they are making any long-term treatment change or addition of a new source. This section of the rule should be made clear that for copper, the system may be required to demonstrate that its finished water continues to be non-aggressive to copper (per 4 above).

8. Additional information needs to be gathered on the current distribution of pH, alkalinity, and phosphate residual among systems nationally to fully understand the implications of this approach.

3.6.2 Copper Compliance

Violations:

- Failure to implement public education, for PWSs that have not demonstrated their water chemistry is not aggressive to copper.
- Failure to maintain a monitoring program representative of the distribution system that demonstrates the system has water chemistry not aggressive to copper.
- Failure to provide notice to and, if required, consultation with the primacy agency, when a PWS makes a significant change in source or treatment (as in the current LCR).
- Failure to implement CCT or other risk reduction actions prior to CCT as determined by the primacy agency.

4 Complementary Actions Critical to the Success of the National Effort to Reduce Lead in Drinking Water

The LCRWG urges EPA not only to promulgate a revised LCR, but also to play a leadership role in educating, motivating, and supporting the work of other agencies, where EPA does not have the authority to act. The LTR LCR is very important. However, removing lead from drinking water systems and reducing exposure to lead from drinking water in the meantime will require renewed commitment, cooperation and effort by government at all levels and by the general public.

Specific recommendations for action in addition to the LTR LCR include (grouped generally by who might take such actions):

<u>EPA Actions</u>

- EPA working across all offices to take an integrated approach to action and education on lead from all sources (paint, air, site clean–up, etc.), with proper emphasis on lead in drinking water, especially in relation to the populations most vulnerable to this source (pregnant women, infants and young children). For example, OGWDW should coordinate with EPA's lead-based paint program so lead hazards are communicated consistently.
- Work with other federal agencies including HUD in terms of lead programs including but not limited to expanding federal funding from those programs to include lead service line replacement; HUD/DOT in terms of efficiency in possible coordination of lead service line replacement with road projects and other construction projects; and CDC in terms of childhood lead poisoning prevention, screening, and protection programs
- Enhanced cooperation with state, county, and local health departments to promote an integrated approach to childhood lead poisoning screening, prevention, and protection that emphasizes drinking water and its potential as a primary lead source (e.g. infants dependent on reconstituted formula).
- EPA needs to work with agencies at all levels of government to support financial assistance programs for LSL removal. Building costs into a PWS's capital budget planning should also be a consideration.
- EPA should include diverse perspectives in its stakeholder engagement programs, including affected consumers (who should not be required to be members of formal organizations), lead poisoning prevention/clean water advocates, EJ advocates, lead/copper corrosion experts, and

representatives from PWSs, States, and federal agencies with Healthy Homes and childhood lead poisoning prevention programs.

Other Federal Actions

- A federal tax deduction to support replacement of the customer portion of LSLs.
- EPA should work with CDC and HHS to ensure that the standard protocol for investigation of any child with elevated blood lead levels or of a home with lead levels above the HAL include determination of whether there is a lead service line.
- EPA should work with HHS and HUD to modify funding guidelines for the Healthy Homes and other federal funding programs to explicitly authorize and prioritize the use of those funds for lead service line removal programs targeting the privately owned portion of any lead service line. The current situation of having tens of thousands of dollars spent by a local Healthy Home or lead poisoning prevention program to remove lead paint, and leave behind a lead service line because of arbitrary funding guidelines is unacceptable.

State or Local Actions

- Local or state building and plumbing codes, including possibility of prohibiting copper plumbing where water is aggressive to copper.
- State Actions to support customer lead service line replacement, e.g.
    - State legislation requiring inspection or replacement on sale of home
    - Disclosure requirements at sale of home
    - Requirements for LSL removal as part of school and day care licensing
    - Building code requirements for LSL removal upon substantial renovation (could be national action as well)
    - Priority in DWSRF funding, especially if increased funding is available. (Criteria states might wish to consider include: PWSs where there is a high incidence of elevated BLLs for children, a high percentage of homes with LSLs, a high percentage of low income families, the PWSs prior efforts to replace LSLs, etc)[13]
- States should consider including requirements for lead in drinking water in state child care licensing rules.

Public Water System Actions

- Options EPA may want to describe in guidance and PWSs could consider include but are not limited to:
    a. Rate design considerations:
        i. Low rates for low volumes
        ii. Household size-based rates

[13] Good examples of programs which facilitate and enable private action include a Massachusetts program which provides a state income tax credit for the replacement of failing private wastewater treatment systems (septic tanks and leaching fields) coupled with a requirement for inspection and compliance with stricter rules upon property transfer; and many local housing rehabilitations programs funded by Federal Community Development Block Grants (CDBG) which provide low or no interest loans for health and safety related improvements, payable upon property transfer, often with loan sunsets where repayment is not required or the balance is reduced over a period of continued occupancy by an income-eligible homeowner. A similar loan program could be authorized by EPA under the Drinking Water SRF program.

b. Non-rate policies
   i. Budget billing
   ii. Fixture retrofits and plumbing assistance by the PWS
   iii. Service line replacement and insurance programs not provided by PWS
   iv. Direct assistance, emergency bill payment relationships
   v. Fixture retrofits and plumbing assistance by NGO organizations providing affordable housing
   vi. Subsidies including LSL / connection replacement costs associated with street, sidewalk, and other repairs not related to drinking water infrastructure
   vii. On-bill financing provided by the PWS
c. Funding guidance
   i. EPA's Financing for Environmental Compliance – Water
   ii. Tools for Financing Water Infrastructure
d. Funding sources beyond rate revenue:
   i. EPA's Drinking Water State Revolving Fund (DWSLF)
   ii. EPA Targeted Grants to Reduce Childhood Lead Poisoning
   iii. USDA's Water and Environmental Programs, U.S. Department of Agriculture, Rural Development
   iv. HUD's Community Development Block Grant Program – U.S. Department of Housing and Urban Development
   v. HUD Healthy Homes Technical Studies
   vi. HUD Office Healthy Homes and Lead Hazard Control Lead Hazard Reduction Demonstration Program
   vii. HUD Health Homes Initiative Lead Elimination Action Program
   viii. HUD Office of Healthy Homes and Lead Hazard Control Lead Hazard Control Lead Technical Studies Grant Program

- PWSs should educate and encourage partnerships with healthcare providers and health departments even when levels are below the AL.

<u>Research</u>

- Additional technical review and/or additional study is needed on how to conduct household and service line flushing to remove particulate lead.
- Published, peer reviewed research explaining that water in plumbing systems with leaded materials and LSLs can have sufficient levels of lead in the water to be a risk to those consuming the water. This paper is important to gaining support from the public health agencies and others and to placing water in context with other sources of lead.
- Considering that lead remains a complex issue and that research and information gaps still exist, the EPA should establish a Research and Information Collection Partnership to encourage the filling of these gaps in knowledge. The RICP should be initiated once the EPA begins working on the revised rule and continue for three years or more into the promulgation of the revised rule.
- The EPA and other agencies, such as the Water Research Foundation, should conduct research (such as bench scale and limited system case studies) to confirm the bins selected to define aggressive waters for copper. The bins are based on theory and need some level of confirmation prior to promulgating an actual regulation. This work can be done within the timeframe of developing a final rule.

5 Conclusion

The LCRWG appreciates the opportunity to provide these recommendations to the NDWAC, offers our thanks to the experts and members of the public who made presentations to the work group, and wishes particularly to acknowledge EPA for the extensive commitment of staff time and expertise to this process.

ATTACHMENT A

NDWAC Lead and Copper Working Group

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Table 1: Elements of utility reports by dates in three-year cycle (*based on EPA adoption of rule in 2017)

Action	2020*	2023	2026	2029	2032	2035	2038	2041	2044	2047	2050
Confirm broad and targeted education programs underway[1]	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.
Status of consumer sampling[2]	NA	# done & # offered	# done & # offered	# done & # offered	# done & # offered	# done & # offered	# done & # offered	# done & # offered	# done & # offered	# done & # offered	# done & # offered
Confirm communication of sampling results[3]	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.
Confirm operation policies in place[4]	Yes. If not, then explain	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.
Replacement Progress[5]	Initial Baseline	85% remaining	70% remaining	55% remaining	40% remaining	25% remaining	17% remaining	10% remaining	6% remaining	3% remaining	0% remaining
If replacement goals not met, number of checklist items confirmed completed (See Table 2)[6]	Basic requirements *[see Section 3.1.2]*	Basic requirements	TBD (by EPA)	TBD (by EPA)	TBD (by EPA)	TBD (by EPA)	TBD (by EPA)	TBD (by EPA)	TBD (by EPA)	TBD (by EPA)	TBD (by EPA)

[1] See Section 3.1.2 (item 4 "targeted outreach" EPA to provide a checklist; PWS to contact customers with LSLs individually atleast every three years and when there is a new customer at that address.

[2] Number of customers offered opportunity to conduct at-tap samples and number of samples taken.

Confirmation that results were provided to the customer. Number exceeding the household action level and confirmation that he results were submitted to health department. Maintain records for review by the primacy agency.

[4] Program to ensure that emergency, maintenance and renovation operations consider risks of disruption to service line increasing lead exposure to residents. .See Section 3.1.2 item 7 (operations).

[5] A service line is presumed lead unless installed after date installation of lead service line prohibited or records or tests by utility confirm entire service line is not lead. Confirming that a service line is not lead counts toward replacement progress.

[6] This is a two-fold concept, the details of which the LCRWG suggests be determined by EPA: 1) provide the PWS the flexibility to select outreach methodsand other efforts appropriate to that community and 2) increase the number of required effortsto be completed if replacement goals are not met. See Table 2 for checklist of options for additional effort (in addition to the basic outreach requirements).

Table 2 Options (in addition to the basic outreach requirements) to be accomplished by utility if replacement progress goals in Table 1 not met.[1]		
Basic outreach requirements: • Individually notify customers with known or possible LSLs describing the risks of lead in drinking water, specifically inviting them to participate in the LSLR program, offering to have the customer's tap water analyzed, and clearly describing the terms of the program and how to follow up. If the customer does not respond or chooses not to participate, the PWS must follow up with another invitation at least every three years and always when there is a new customer at that address. (see Section 3.1.2 for additional details) • Provide a written offer to replace the LSL when work is being done on the water main in the street (with the same information above).		
Resident engagement	System policies	Other
1. Notice to new customers of need	1. Plumbing code requires full replacement if service line will be disturbed.	1. Local health agency contact with resident.
2. Written offer to replace when main in street rehabbed (customer pays)	2. Grants or low-interest loan funds identified to cover customer costs sufficient to maintain progress for period.	2. Local health agency funding for removal as part of remediation
3. Written offer to volunteer (customer pays)	3. Financing options such as liens on home provided to customers or tax deductions for property owner costs.	3. Media campaign launched
4. Written refusal from customer(s)	4. MOU or other arrangement to implement notification of customers/property owners by other utilities about replacement options if LSL is disturbed	4. Homeowner association(s) send letters to members supporting replacement.
5. Certified letters sent	5. Capital improvement plans target system pipe rehab and replacement to areas with more LSLs	5. Real estate organizations notified of requirement for replacement of LSL on sale or transfer of title
6. In-person call or visit made	6. Service line insurance program revised to include replacement LSLs if damaged or leaking	6. Cooperative outreach efforts with non-profits
7.	7. More aggressive flushing in areas with LSLs to manage iron related lead particles	7. Coordinated outreach with WIC
8.	8.	8. Outreach to plumbers/contractors
9.	9.	9. Outreach to ob/gyns and pediatricians
10.	10.	10. Local ordinance requiring inspection/notification/replacement of LSLs upon sale or transfer of title
11.	11.	11. LSL identification added to home inspector standard operating procedures
12.	12.	12.
[1] EPA will provide guidance on the options and update them periodically as best practices evolve.		