RECORD OF DECISION

Portland Harbor Superfund Site

Portland, Oregon

U.S. Environmental Protection Agency Region 10

Seattle, Washington

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PART 3 – RESPONSIVENESS SUMMARY

Record of Decision

Portland Harbor Superfund Site

United States Environmental Protection Agency
Region 10

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Acronyms and Abbreviations

AOC	Administrative Order on Consent
ARAR	applicable or relevant and appropriate requirements
BaPEq	benzo(a)pyrene equivalents
BEHP	bis(2-ethylhexyl) phthalate
BERA	baseline ecological risk assessment
BHHRA	baseline human health risk assessment
BMPs	best management practices
CAG	Portland Harbor Community Advisory Group
CDF	confined disposal facility
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act of 1980
C-FERST	Community-Focused Exposure and Risk Screening Tool
CFR	Code of Federal Regulations
cPAH	carcinogenic polycyclic aromatic hydrocarbon
COC	contaminant of concern
CSM	conceptual site model
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DEQ	Oregon Department of Environmental Quality
DDx	sum of 2,4'- and 4,4'- DDD; 2,4'- and 4,4'- DDE; and 2,4'- and 4,4'- DDT
EJSCREEN	EPA's environmental justice screening tool
ENR	enhanced natural recovery
EPA	U.S. Environmental Protection Agency
FMD	future maintenance dredge
HxCDF	1,2,3,4,7,8-hexachlorodibenzofuran
ICs	institutional controls
LSS	Legacy Site Services
LWG	Lower Willamette Group
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MNR	monitored natural recovery
M/W/ESB	Minority, Women and Emerging Small Business enterprises
MOU	February 2001 Memorandum of Understanding
NAPL	non-aqueous phase liquid
NAVD88	North American Vertical Datum 1988

NCP	National Contingency Plan
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRRB	National Remedy Review Board
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PeCDD	1,2,3,7,8-pentachlorodibenzo-p-dioxin
PeCDF	2,3,4,7,8-pentachlorodibenzofuran
ppb	parts per billion
PRG	preliminary remediation goal
PRP	potentially responsible party
PTW	principal threat waste
RAL	remedial action level
RAO	remedial action objective
RM	river mile
RNA	regulated navigation area
ROD	record of decision
SDU	sediment decision unit
SEF	Sediment Evaluation Framework
Site	Portland Harbor Superfund Site
SMA	sediment management area
SuperJTI	Superfund Jobs Training Initiative
SWAC	surface-weighted average concentrations
TCDD	tetrachlorodibenzo-p-dioxin
TCDF	2,3,7,8-tetrachlorodibenzofuran
TPH	total petroleum hydrocarbon
UCLs	upper confidence limits
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
USACE	U.S. Army Corps of Engineers

Section 1

Introduction

1.1 Overview and Background

This responsiveness summary provides a summary of the public's comments submitted to the U.S. Environmental Protection Agency (EPA) regarding the proposed plan (USEPA 2016c) for the in-river portion of the Portland Harbor Superfund Site (Site) and EPA's responses to those comments. A responsiveness summary is required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at 40 Code of Federal Regulation (CFR) § 300.430(f)(3)(F). All comments summarized in this document have been considered in EPA's final decision for the selection of the remedy for the Site.

During the public comment period, 7 out of the 10 signatories to the *Administrative Settlement and Order on Consent for the Remedial Investigation/Feasibility Study* (AOC), U.S. EPA Docket No. CERCLA-10-2001-0240, submitted three separate formal dispute statements[1] regarding EPA's feasibility study report (USEPA 2016b).

EPA's responses to all of the dispute issues are included as a part of this responsiveness summary. The dispute statements and supporting information provided by the Lower Willamette Group (LWG) have been considered in EPA's final decision for the selection of the remedy for the Site. These documents, EPA's responses, and the final dispute decision by the Director of Region 10's Office of Environmental Cleanup are included in the Administrative Record, which contains this record of decision (ROD) and other documents that form the basis for EPA's selected remedy.

EPA has worked closely with tribes, community members, and other stakeholders throughout the development of the remedial investigation, feasibility study, and proposed plan for the Site. Community participation played an essential role in the development of the proposed plan and ROD for the Site and is described in more detail below.

The responsiveness summary is organized as follows:

- Section 1 – Introduction
- Section 2 – Public Comments and Responses
- Section 3 – Tribal Comments and Responses
- Section 4 – State Comments and Responses
- Section 5 – National Marine Fisheries Service (NMFS) Comments and Responses

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[1] The seven LWG members are: Arkema, Inc., Chevron, U.S.A. Inc., Evraz, Inc. N.A., Gunderson LLC, NW Natural, TOC Holdings Co., and Union Pacific Railroad Company.

- Section 6 – References Cited
- Appendix A – PRP Dispute Resolutions for June 2016 – Legacy Site Services, Lower Willamette Group, Union Pacific Railroad

1.2 Community Involvement Activities before Issuing the Proposed Plan

EPA's outreach goal is to educate the community about the work being done at the Site and collaborate with stakeholders on how to successfully engage the public. In 2002, EPA developed a Community Involvement Plan after interviewing community members and other stakeholders. The plan has been updated throughout the process. Since the Site was listed, EPA has used public information sessions, fact sheets, websites, one-on-one discussions, and participation in community events as ways to share information about the Site with the broader community. Furthermore, EPA has provided financial support to the Willamette Riverkeeper since 2001 via a technical assistance grant, which allows a community group to contract their own technical advisor to interpret and explain technical reports, site conditions and EPA's proposed cleanup proposals and decisions. The Willamette Riverkeeper has used this grant to give support to the Portland Harbor Community Advisory Group (CAG), which provides a public forum for community members to learn about the Site and share community needs and concerns. Additionally, EPA established a listserv for the Site that now has over 3,000 subscribers as a method for sharing information and relevant events quickly and efficiently.

EPA made significant community outreach efforts leading up to the release of the proposed plan (USEPA 2016c) to get community input and to prepare people to participate in the public comment period. These efforts included producing and disseminating quality information such as community information cards, fact sheets, and videos; establishing information repositories at the Multnomah County Central Library, the St. Johns Library and the Kenton Library where the public can review documents associated with the Site; maintaining current information on EPA's Portland Harbor website; providing valuable information via the EPA Portland Harbor listserv; sustaining strong partnerships with the Oregon Department of Environmental Quality, the Oregon Health Authority, and the City of Portland to maximize community outreach efforts; attending and presenting at public forums and meetings; and organizing multiple community information sessions during January, February, and March of 2016. A detailed list of specific community involvement activities is available in EPA's current Portland Harbor Community Involvement Plan (accessible on EPA's website).

Additionally, EPA has engaged with many different groups over the years, including groups that represent or are concerned about communities with environmental justice concerns. EPA takes environmental justice seriously and has worked to understand environmental justice concerns in the Portland Harbor study area by using existing tools (such as EPA's Environmental Justice Screen tool and Community-Focused Exposure and Risk Screening Tool), applying the six principles of environmental justice that are outlined in Executive Order 12898 (Environmental Justice: Guidance Under the National Environmental Policy Act) and working with community groups. Some of the main groups that EPA has engaged with at the Portland Harbor Superfund Site include Communities of Color, Native American Youth Association, Latino Network, Right 2 Dream Too, Right 2 Survive, Willamette Riverkeeper, the Slavic Immigrant Association, Ecumenical Ministries Oregon, the Coalition of Black Men, the Oregon Environmental Justice Task Force, Oregon Tradeswomen, League of Women Voters, Verde, Portland Harbor Community Coalition, Sierra Club Portland, Occupy St.

Johns, Audubon Society, Asian Pacific American Network of Oregon, Vietnamese Community of Oregon, Portland neighborhood associations, and schools. EPA will continue to work with these groups and other interested parties to make sure that future outreach efforts reach historically underrepresented communities.

Lastly, throughout the process, EPA has meaningfully engaged with the affected tribes (the Confederated Tribes and Bands of the Yakama Nation, the Confederated Tribes of the Grand Ronde Community of Oregon, the Confederated Tribes of Siletz Indians, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Nez Perce Tribe) and has encouraged and facilitated tribal involvement, including conducting formal tribal consultations. The tribes were active members of the Technical and Legal Coordinating Teams for the Site established under a Memorandum of Understanding signed in 2001. The most recent government-to-government consultations occurred in July 2016. EPA considered numerous factors, such as tribal fish consumption rates and the effects of contamination at the Site on treaty-protected resources, to develop remedial alternatives for the Site. EPA recognizes that these tribes have treaty-reserved or other fishing rights in areas impacted by the Site and that, once implemented, the cleanup will improve fish habitat and help further the tribes' rights to fish.

Public outreach activities are further described in response to specific comments in Sections 2.35.2 and 2.36.1 of this document.

1.3 Community Involvement Activities after Issuing the Proposed Plan

Specific public engagement activities and other activities were conducted just prior to and after the June 8, 2016 release of EPA's Superfund proposed plan (USEPA 2016c) for the cleanup of the in-river portion of the Site. EPA extended the public comment to 90 days from the 30 days required by the NCP due to high community interest and requests for extensions. The public comment period ran from June 9 to September 6, 2016. The remedial investigation, feasibility study, proposed plan, and maps and other supporting documents were posted on EPA's Portland Harbor webpage. Hard copies and compact discs of the proposed plan and administrative record were made available at the information repositories.

The public comment period was announced in a number of locations to reach the widest audience possible. A public notice appeared in The Oregonian (both print and online) on June 8, 2016. Additionally, EPA sent announcements to the EPA Portland Harbor e-mail listserv, the Portland Office of Neighborhood Involvement e-mail list and the Portland Harbor CAG; posted to the EPA Region 10 Facebook page and Twitter page; delivered information to media outlets; and also updated the EPA Portland Harbor website.

EPA held a series of four public meetings during the public comment period. These public meetings were well advertised via e-mail, posting on the Portland Harbor website and on EPA social media accounts, dissemination of media advisories, and directly posting EPA notices in The Oregonian, The Skanner, The Asian Reporter, El Hispanic News (translated into Spanish), KAHOH (translated into Russian), and the Phương Đông Times (translated into Vietnamese). The meeting venues were widely spaced throughout the metro area (City of Portland Building, EXPO Center, University Place Conference Center, and the Ambridge Center). Two formal presentations of the plan were given at each meeting, followed by a question and answer period and an informal open house where the public could discuss the plan directly with EPA staff and ask questions one-on-one. At all public meetings,

there were opportunities to provide both written and oral comments on the proposed plan for the record. Language interpreters were available in person at the June 24 meeting (Spanish, Russian, Vietnamese, and Chinese) and at the July 20 meeting in the evening (Spanish, Russian and Arabic) and by telephone if needed for the June 29 and July 11 meetings. A community fact sheet as well as an acronym, glossary, contaminant summary and a handout detailing how to give written or oral comments were available in English, Spanish, Vietnamese, Chinese, and Russian at each public meeting. Transcripts from all of the public meetings are in the Administrative Record.

In addition to EPA-sponsored public meetings during the proposed plan public comment period, EPA discussed the proposed plan with the Confederated Tribes of Warm Springs, the Confederated Tribes of Grand Ronde, the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation and the Nez Perce Tribe, the potentially responsible parties (PRPs) allocation group, the Portland City Council and the Federal Congressional Delegation

Public outreach activities are further described in response to specific comments in Sections 2.35.2 and 2.36.1 of this document.

EPA's efforts to provide opportunities for public participation have gone well beyond the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the NCP. The input EPA received from the public and other stakeholders throughout the remedial investigation/feasibility study was instrumental in developing the proposed plan and the ROD. Changes to the selected remedy as a result of public comment are documented in the ROD and in responses to comments in this responsiveness summary. The ongoing involvement of the community, tribes, and other stakeholders will remain an important part of the cleanup as it moves forward.

1.4 Overview of Comments Received

A total of 5,348 individual comment submissions were received. Comments were received by mail (paper post cards and letters), email, submission of written comments at public meetings, and submission of oral comment at public meetings (stenographer's transcript). Many comments were clearly personal thoughts (typed or hand written) and others were "form" submissions that were part of mailing or email campaigns, often with personal comments added. Any comments that were received in another language (oral or written) were translated.

Each submission was given a sequential individual comment ID number. Some commenters submitted more than once in the comment period using one or more of several different methods. For each ID number assigned, basic identification information (date received, commenter name, comment method [e.g., email, letter, and transcript], title or opening sentence) were tracked. A master spreadsheet was developed to track assigned identification numbers (such as 101.1, 101.2, 101.3, etc.) and the comments made in each submission. For larger comment submissions (generally from PRPs, government entities, or organizations), a summary of the comment was entered in the master spreadsheet. Names of individuals who submitted comments were recorded and tracked but are not available to the public due to EPA's Privacy Policy and commitment to protect personally identifiable information. Names of businesses, organizations, and government entities submitting comments are listed in Exhibit 1 below.

Exhibit 1. Businesses, Groups, Organizations, and Government Entities Who Submitted Comments

Businesses and PRPs

- ARCo and BP West Coast Products
- Brix Maritime
- Calbag Metals Co. Cascade General, Inc.
- Cascade General Portland Shipyard
- Chevron
- ESCO
- Evraz
- Exxon Mobil
- FMC Corp
- Geosyntec
- Greenbriar Gunderson
- Kinder Morgan's
- Knife River
- Legacy Site Services
- Lower Willamette Group
- MMGL Corporation
- MUR
- Northwest Natural
- Northwest Pipe
- Olympic Tug and Barge
- Participation and Common Interest Group
- PGE Portland Harbor PRAP
- Port of Portland
- RM 11E Group
- Schnitzer Steel Industries, Inc.
- Shell Oil Products Comments
- Shore Terminals
- Siltronic
- Swan Island Group
- SLR International
- The Marine Group BAE
- Tidewater Barge Lines, Inc.
- TOC holdings Co
- Toyota
- Union Carbide
- Union Pacific Railroad
- Volcano Partners

Groups and Organizations

- Associated Oregon Industries
- Cathedral Park Neighborhood Association
- Columbia Corridor Association
- Columbia Riverkeeper
- Friends of Baltimore Woods
- Friends of Pier Park
- Impact Northwest
- League of Women Voters
- Linton Neighborhood Association
- MAWE
- North Clackamas Urban Watersheds Council
- Northwest Industrial Neighborhood Association
- Northwest Toxic Communities Coalition
- Oregon Association of Minority Entrepreneurs
- Portland Audubon Society
- Portland Business Alliance
- Portland Freight Committee
- Portland Harbor Community Advisory Group
- Portland Harbor Community Coalition
- Portland Youth and Elders Council
- Sierra Club
- Sierra Club - Oregon
- St. Johns Neighborhood Association
- Sediment Management Working Group Southwest Neighborhoods Inc.
- University Park Neighborhood Association
- Western States Petroleum Association
- Willamette Partnership
- Willamette Riverkeeper
- Working Waterfront Coalition

Tribes

- Confederated Tribes and Bands of the Yakama Nation
- Confederated Tribes of the Grand Ronde
- Confederated Tribes of Siletz Indians
- Confederated Tribes of the Warm Springs Reservation
- Umatilla Indian Reservation
- Nez Perce Tribe

Other Government Entities

- City of Portland
- City of St Helens
- Department of State Lands
- National Marine Fisheries Service
- Oregon Department of Environmental Quality
- State of Oregon
- US Army Corps of Engineers
- West Multnomah Soil & Water Conservation District

Other

- Region 10 Regional Tribal Operations Committee

A majority of comments received by EPA showed support for a cleanup of the river. Opinions on how that cleanup should take place were more diverse. A large number of commenters want more cleanup to occur than what was proposed while some commenters believe less active cleanup is needed. The most commonly seen comments were those that were included in form mailings (email or standard mail). The top 10 comments are shown below along with the section number in this responsiveness summary in which they are addressed in this document (from most to least common):

1. Clean up should make unlimited fish consumption safe for all groups of people (Section 2.3.2)
2. Support for more cleanup than Alternative I (Section 2.1.1)
3. Do not use a confined disposal facility (Section 2.14.1)
4. Consider community support for another cleanup alternative (B, G, G+, and/or H) (Section 2.31.1)
5. Ensure that the PRPs pay for cleanup (Section 2.23.1)
6. Ensure source areas are controlled (Section 2.27.1)
7. Improve insufficient environmental justice response (Section 2.35.2)
8. Provide timelines and metrics for success (Section 17.1)
9. Ensure instream monitoring before, during, and after remediation (Section 2.17.3)
10. Move quickly and don't delay cleanup (Section 2.2.3)

From a very big picture perspective, the CAG supported more cleanup than the preferred alternative and opposed use of a confined disposal facility (CDF). Environmental and/or community organizations generally echoed the CAG's concerns and wanted quality of life monitoring during cleanup and better baseline monitoring. They also wanted to make sure that the PRPs would be held responsible for the cost of cleanup. The tribes wanted more cleanup and were generally concerned with human health risk from ingestion of fish, environmental risk, the role of the tribes in remedial design and cleanup, and the protection of treaty rights. Groups representing businesses and those PRPs that submitted comments generally opposed all or large components of the preferred alternative, based on cost, cost-effectiveness, and technical concerns. They wanted flexibility in implementing the remedy (where and how) and also wanted remedial action levels to be more consistent throughout the Site. Local government comments cited jobs, infrastructure, cost, short-term impacts, sustainability, seismic and climate change issues, and coordination with EPA and the state. The state was supportive of the preferred alternative and provided comments that, among other things, asked for more flexibility during remedy implementation, requested more detail about river bank cleanup, and identified the need for the remedy to be coordinated with Department of State Lands, where necessary. Most people who expressed a preference in the remedy cited Alternatives G or H. Some local residents expressed concern over the cost of the preferred alternative, impacts on jobs and the local economy from the cleanup, and construction impacts of any remediation.

EPA received a number of submissions days and months after the close of the comment period. The comments have been labeled as "late comments" and added to the administrative record file. EPA has reviewed the late comments, including the documents enclosed with them. Consistent with 40 CFR § 300.825(c), the comments are included in the administrative record file as late comments, as opposed to being incorporated into the responsiveness summary, because none of the comments, or other information submitted with the comments, substantially support the need to significantly alter EPA's selected remedy. Moreover, much of the information is somewhat or entirely duplicative of information already contained in the administrative record file.

Section 2

Public Comments and Responses

2.1 Extent of Cleanup

2.1.1 Support for More Cleanup (No Specific Alternative Given)

Comment Summary

A total of 2,437 comments expressed support for a more robust cleanup than what was described in the proposed plan (USEPA 2016c). About half of these were from form emails or postcards. These comments often specified that at least 1,000 additional acres should be removed. The sediment removal percentage of 8 percent in the proposed plan was also cited frequently and was said to be unacceptable.

The form comments seen most frequently are:

- "The proposed cleanup of the Portland Harbor is a big win for industry and a bad deal for the public. EPA's cleanup proposal tackles just 8 percent of a site area that is 100 percent toxic. A more aggressive plan is needed to prevent even more harm to human health and the environment. On behalf of all people who rely on the river for food, recreation, employment and culture, I urge EPA to implement a plan that: Moves quickly and sustainably reduces contaminants causing harm to Willamette and Columbia River resources. Includes ongoing monitoring and cleanup upriver and downriver from the site. Contributes to healthy fish that are safe to eat for all people. Holds polluters accountable for creating a safer Portland Harbor."
- "At least 1000 acres of the most highly contaminated sediment should be dredged and removed to achieve the Fish Consumption Advisory goal" (or a slight variation of this).

The remainder of the comments were personal comments urging EPA to do more. Many of them were similar to the form comments in content but included personal thoughts on why doing more was important to the commenter.

Representative comments from this group include:

- "I am disappointed with EPA's proposed cleanup plan for the Willamette River. I live in SW Portland close to the river, and am aware of the contamination that spreads through the ecosystem as a result of the toxic levels of the river. This is a unique and rare opportunity to have meaningful and lasting cleanup and environmental restoration. I do not believe the current proposed cleanup plan goes far enough to properly clean up the river. This opportunity should not be wasted. The Willamette River is unsafe for fishing and swimming. I believe the proposed plan should be modified to include additional dredging and other measures in order to ensure a proper cleanup is undertaken."
- "I am very disappointed in the thoroughness of EPA's cleanup plan. It does not go far enough to properly cleanup the river, due to a "balancing formula" which weights minimizing costs more that extent of cleanup."

- "I am writing in regard to the proposed superfund cleanup. We need to clean up ALL of the polluted areas, not just some. It's difficult to fathom why this is even up for debate: The draft cleanup plan leaves far too much of the river contaminated for generations to come."
- "I believe the Draft Cleanup Plan isn't adequate in its current state to sufficiently recover the Willamette River Superfund Site. More than 65 known toxic chemicals are present throughout this stretch of river which pose serious chronic and acute health effects to humans, fish and wildlife. I would like to see EPA adopt a more aggressive approach to remediation. Specifically, I recommend even more dredging to remove contaminated sediment from the Willamette River. The current plan proposes to remove sediment from less than 10 percent of the area -- that doesn't go far enough."
- "I do not feel that the proposed plan goes far enough to remove toxic sediment. I am deeply concerned that we are bringing our waterways to the brink of total devastation. I live in Portland and the Willamette is a key part of my life. I go to the Selwood Dog Park and swim from my friend's houseboat. I am concerned that the toxic sediment is too dangerous for the species on the river."
- "I feel that people might say, well, where is your evidence that this is not enough. I think that the onus is on the people saying this plan is enough to show indisputably that it is enough, and it's not. I feel like the numbers, the amount of sediment that is taken out, the amount of years it's going to take is pulled out of a hat, and it's not adequately grounded. I'm very concerned."
- "I have raised 4 children in Portland in the last 28 years and wish we could have felt safe swimming and fishing in the Willamette. For the sake of future generations, please work to remove the contamination completely form the river, not just 8 percent."
- "Why not take this opportunity, for ourselves, for our wildlife, and for our ecosystem, to do a proper job of it? I can think of many reasons to not do otherwise, otherwise being what this plan proposes. The current plan is insufficient. I encourage EPA to consider a stronger plan, with more dredging and proper disposal of contaminants and with less reliance on covering them up or, more importantly, simply leaving them be in order for them to be disposed of (only perhaps, and oh so slowly, and not ever removed properly from the sediment and water of the rivers and ocean) by the river. People and wildlife are suffering from this contamination every day."

EPA Response

EPA sought in its proposed plan (USEPA 2016c) and in the selected remedy to develop a cost-effective alternative that balances several important factors, including maximizing risk reduction in the quickest timeframe while minimizing to the extent possible the impacts to the environment during construction; disturbance to the habitat for benthic invertebrates, fish, and wildlife; and long-term restrictions on human uses that can be allowed at capped areas. Due to the concern of the vast majority of commenters that the proposed plan left too much contamination for monitored natural recovery (MNR) as well as other issues raised with the proposed plan alternative, EPA has selected Alternative F Modified, which will actively address an additional 103 acres of contaminated sediment. Thus, the selected remedy will remove up to approximately 3 million cubic yards compared to the roughly 1.7 million cubic yards of sediment removed under Alternative I.

Contamination at the Site is not evenly distributed. There are high levels of contamination in certain areas that represent an ongoing source of contamination to the Willamette River and downstream.

EPA's selected remedy will actively remediate these higher concentration areas through a combination of dredging and capping. The selected remedy reduces risks due to people eating contaminated fish by 76 percent by dredging and capping 18 percent of the Site (394 acres of 2,167 total acres). Details about the number of acres addressed through cleanup, volume of contaminated material dredged, and other information for Alternative F Modified is included in Appendix IV of the ROD.

Dredging plays a significant role in the selected remedy as do capping, MNR, and enhanced natural recovery (ENR), based upon engineering considerations of site conditions (such as potential for erosion, sedimentation from upstream, and observed trends in natural recovery). The selected remedy calls for the highest levels of contamination to be removed through dredging (up to approximately 3 million cubic yards of material) or to be isolated through capping (176 acres). ENR and MNR are employed only in areas with lower levels of contamination. EPA's analysis of alternatives shows that any larger, removal-based remedy beyond Alternative F Modified would not substantially improve public health and environmental protection but would take a good deal longer; cost substantially more; have greater short-term impacts to aquatic organisms in the waterway and to the community surrounding the waterway because of dredging activity; and require the processing, transporting, and landfilling of millions of additional cubic yards of sediment with low levels of contamination.

Reductions in the sediment contaminant levels remaining after active remediation are expected to occur as cleaner upriver sediments deposit on surface sediment in the Site during low-flow periods and bury and dilute contaminated sediment. These sediments may be diluted to levels below risk thresholds, become buried below the depth where exposures to organisms can occur, or potentially be dispersed downstream during higher flow periods. Monitoring will be performed to measure progress toward achieving cleanup levels. The results of the monitoring program will be used to determine whether any additional actions are required to achieve the cleanup levels.

2.1.2 Support for Less Cleanup

Comment Summary

A total of 104 comments expressed a desire for less aggressive cleanup. They were almost always part of individual letters containing multiple comments, and the support for less was often paired with other topics found in this responsiveness summary, like danger to workers and economic harm to adjacent businesses. Commenters generally believed that Alternative I would be very disruptive and could potentially spread contamination downstream and uncover sediments that were already covered by natural deposition. Many comments referred to a study stating that natural recovery of the river is occurring and that the contaminant concentrations had already been reduced by 40 percent.

Representative comments include:

- "The Portland Harbor PRAP goes too far in recommending Alternative I. This Alternative does not appropriately balance risk reduction with cost effectiveness. Over a billion dollars will be spent to protect a population that is difficult to quantify in terms of who is eating fish and how much fish is being eaten. EPA's approach should focus on hot spot remediation more in line with Alternative B or D. Expanding remediation will not provide a significant risk reduction relative to cost. EPA needs to update their data used for decision making as recent data shows significant improvement in the river. In addition, EPA has to incorporate and evaluation of sustainability in the remedy to demonstrate the real cost to the environment and economic cost. EPA needs to look

hard at what it has proposed and reevaluate the approach to produce a better remedy that doesn't burden Portland."

- "In addition to being a small business owner, I am a geologist and I am very concerned about the plan that EPA has proposed. They plan to dredge 167 acres and remove 1.9 million cubic yards from the Willamette and transport it to a landfill. As a study found in 2014, natural processes at work in the Willamette have already reduced contaminant levels by at least 40 percent. The contaminated sediments, once they're compacted by these natural processes, usually won't leach out."
- "Less invasive cleanup methods sound like the better option, as has been done in the past in other areas. It seems like these methods would also work in this situation, especially considering the river has begun to restore itself naturally. Recent reports show there has been a 40 percent reduction in contamination levels. EPA is putting too high a priority on trying to make the river completely clean at an unreasonable cost, instead of allowing the natural process to continue."
- "A lot of things have changed in the last 12 years and if there is any evidence natural restoration is working, the river should have a chance to heal itself. I agree with the course of action the Army Corps of Engineers recommends: waiting to see how natural processes work and then using more aggressive measures like dredging in a limited manner as necessary."
- "Please do NOT dredge. Instead, let's restrict businesses from discharging waste into the river. Dredging kills wildlife for miles - it's happened before. We are 5 generations strong in North Portland - it has to stop!"
- "Dredging should be minimized, since "[l]imited data exists on the depth of contamination at the Site." (Plan, p. 29.) Dredging sediments that do minimal harm in place is problematic—the dredging activity disturbs undredged sediments, potentially redistributing them to locations where they will be more harmful. It also requires a location to deposit them, which creates its own set of problems, including construction of a confined disposal facility. (See "Disposed Material Management" discussion, proposed plan p. 31.) If the extent of dredging cannot reliably be predicted, dredging in any areas other than those already dredged to maintain the navigation channel should be avoided."
- "I live in the same neighborhood in Southwest Portland that I grew up in. I believe the Willamette River cleanup proposal is a serious mistake. It does not approach making sense to resurface buried pollutants and risk contaminating the river all over again. That would endanger the people and wildlife of Portland for no discernable reason. EPA should devise a plan that builds upon natural decontamination rather than reversing it."
- "I am opposed to the costly EPA plan to dredge out a big chunk of the Willamette River. If they dig down into the riverbed, they would bring up more sediment and pollutants that would contaminate other parts of the river."
- "If the river is correcting itself, it should be allowed to do so with as little input from humans as necessary. We should not be invading Mother Nature's process to the point that we're simply pushing all of that pollution and contamination back to the surface and out into the air."'

Two personal comments were received that spoke to the concern that proposed cleanup levels were not attainable. Specifically:

- "Proposing remediation levels that are below current background levels of presence for some contaminants, along with high fish consumption estimates for a very small segment of the population create basically unattainable level of remediation to be borne by the currently identified operators along the river."

EPA Response

EPA has determined that contamination found in sediment, groundwater, surface water, and biota in the Site presents an unacceptable risk to human health and the environment. There is no more recent data that would indicate there is no risk at the Site.

Active dredging, capping, and ENR will be performed under the selected remedy to address principal threat waste (PTW) and the worst of the contamination identified in the river; however, the larger area of contaminated sediment, covering 1,774 acres, will be remediated through MNR. It is important to recognize that the selected remedy relies on active cleanup to achieve the sediment remedial action levels (RALs) developed in the feasibility study, and MNR is being relied upon to further reduce contaminant concentrations to the more stringent cleanup levels and fish tissue targets. However, MNR has not been shown to be effective on its own to address some of the most highly contaminated areas in the harbor. As described in Appendix D8 of the feasibility study, six lines of evidence considering a range of physical and anthropogenic factors were evaluated to assess the viability of MNR for each sediment decision unit (SDU). Scores of -1, 0, or +1 were assigned based on each line of evidence representing whether deposition was unlikely (erosional), neutral (transitional), or likely (depositional), respectively. The scoring framework using these lines of evidence and the scores for each SDU are presented in Table D8-2 and Table D8-3 of the feasibility study report (USEPA 2016b) Appendix D, respectively.

While active remediation within the river and along the river bank, such as dredging, has higher short-term impacts than MNR, best management practices will be implemented to minimize contaminant releases from the remediation area. Engineered control measures (such as silt curtains and rigid containment) will also be implemented, where necessary, to limit contaminant releases.

2.2 Community and Local Business Concerns

2.2.1 Retain Local Jobs and Industry

Comment Summary

A total of 399 comments were received on the topic of retaining local jobs and industry. About 85 percent were received as form emails or postcards from the Portland Business Alliance, Greenbriar, or another group.

Representative form comments include:

- "A big, expensive river cleanup may sound like a good idea. But it isn't. I want to see EPA support a clean river. But I also want to see EPA support a strong Portland economy. A strong economy relies heavily on the blue-collar jobs that exist on the Willamette River. Please do whatever you can to support the river and our health but also to make sure our jobs don't go away."

- "Hi, I seldom write public officials but I am today because I believe in clean rivers. We need to clear up the river, but I hope EPA regulators understand that we can't have a pristine river that gets that way at the expense of small businesses and jobs. Thank you for what you do for our environment. Please consider my thoughts and approve a plan that's good for our economy as well."

- "Our Gunderson operations in Portland feature the only sideways launch for marine vessels west of the Mississippi and provide nearly 12,000 family-wage jobs. I urge EPA to support a more cost-effective plan that relies on the most current data, preserves local jobs and protects from unnecessary cost increases."

- "I SUPPORT A CLEANUP OF THE LOWER WILLAMETTE RIVER THAT PROTECTS THE HEALTH OF PORTLANDERS AND THE ENVIRONMENT AND IS DONE COST-EFFECTIVELY. The Willamette River is many things to Portlanders - a place for recreation, a home for wildlife and also an industrial harbor, Oregon's largest seaport. Portland's working harbor is important to me. Nearly 30,000 people are employed in Portland's working harbor, jobs that must be preserved during the cleanup."

The remaining 58 comments were personal comments from trade groups, businesses, and residents. Representative comments include:

- "The cleanup will be funded largely by local businesses, local utilities and local and state government. The impacts to the region of diverting capital dollars to a cleanup effort will mean employees will not be hired or lose their existing job, capital investments are not made and operational and infrastructure efforts will be scaled back or not happen at all."

- "The Oregon Building and Construction Trades Council is an umbrella organization for approximately 25,000 union construction workers in Oregon. We recognize the proposed plan marks a significant milestone in a very long process for the Site. We support a river cleanup that protects the health of Portlanders and the environment and is done cost-effectively.... Nearly 30,000 people are employed in Portland's working harbor, jobs that must be preserved during the cleanup."

- "The Portland Business Alliance (Alliance) represents close to 1,900 small and large businesses that employ 350,000 workers in the Portland region. The Alliance supports cleaning up the Site to protect public health and the environment. The Alliance also supports doing so in a way that is mindful of the impacts on the economy, jobs and other important local priorities. The cost of the cleanup will be borne throughout the community. In 2013, the Alliance commissioned a study that looked at the economic linkages from marine industrial businesses. The study analyzed vendors and suppliers to five large marine industrial businesses. At the time, 42 percent of the goods and services purchased by these five businesses were derived from local businesses, often small businesses. In all, about 300 local businesses are part of the supply chain for just five large marine industrial businesses."

- "I've lived in Portland a very long time and I don't want to see our economy hurt by EPA's river cleanup plan."

- "In recognition that there are many comments pushing hard on all sides, I want to encourage a broader view by the agency. I strongly support balanced, collaborative efforts to clean up Portland's Willamette River. With a fragile local economy so strongly connected to global trade

combined with a community ethos that emphasizes environmental protection and sustainability, we need to make sure the cleanup of hotspots is effective, Portland's blue-collar harbor jobs do not suffer, and the overall cleanup plan is not too expensive."

EPA Response

CERCLA, or EPA's two threshold criteria for selecting a Superfund statute, establishes five principal requirements for the selection of remedies. Remedies must:

- Protect human health and the environment
- Comply with applicable or relevant and appropriate requirements (ARARs) unless a waiver is justified
- Be cost-effective
- Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable
- Satisfy a preference for treatment as a principal element, or provide an explanation in the ROD why the preference was not met.

Within this context, EPA has nine remedy selection criteria described in the Superfund statute and its implementing regulations, commonly known as the National Contingency Plan or NCP. The individual criteria are either threshold, balancing or modifying criteria. EPA's threshold criteria for selection of a Superfund remedy are:

- Overall protection of human health and the environment
- Compliance with applicable or relevant and appropriate requirements of federal and state environmental laws

Once these two criteria are satisfied, EPA determines the best balance of tradeoffs among the alternatives with respect to five balancing criteria, which are long-term effectiveness; short-term effectiveness; costs; reduction of toxicity, mobility and volume; and implementability and two modifying criteria, which are state and community (including tribal) acceptance, which includes a wide spectrum of often competing concerns.

EPA appreciates the concerns of the local workforce and businesses as important segments of the community as well as the desire expressed in many comments to retain the industrial/manufacturing base in this area. While there is no specific remedy selection criterion with respect to impact on local economies and business, EPA does consider these concerns in the broader context of its remedy selection criteria. For example, EPA considered current and reasonably anticipated future land use when developing the selected remedy to ensure that the remedy will be protective in the long term and will work with landowners and businesses through the design and implementation of the selected remedy. EPA will encourage the companies performing the cleanup to keep cleanup jobs with locally trained workers as much as possible and will offer resources where possible to teach special hazardous materials skills necessary to perform the cleanup. As EPA progresses through the design and construction of the remedy, it intends to work with local businesses to minimize potential adverse

impacts on them and to the local economy. The agency will draw on the many lessons learned from other communities and cleanups implemented under CERCLA to minimize the effects.

EPA is aware that other entities have been studying the economic impacts of the cleanup. For example, the City of Portland commissioned a 2012 economic study specific to the Superfund cleanup entitled *Economic Impacts of the Portland Harbor Superfund Site Cleanup* (Econorthwest 2012). A City of Portland press release described some of the study's finding as: "clean-up will inject new spending into Portland's regional economy and support jobs;" and "for every dollar spent on cleanup, more than a dollar in additional spending will be generated in the Portland economy as those employed in the cleanup purchase other goods and services in the region." It is EPA's belief that moving forward with the cleanup may enable properties to be more readily developed, which in some cases may have sat idle for years due to contamination issues.

2.2.2 Hire Locally

Comment Summary

Twenty-nine comments were categorized as supporting local hiring during cleanup. Many requested that local people and firms be used where possible in conducting the cleanup work at the Site. Several people suggested apprenticeship programs. These comments came from residents, local associations (Oregon Association of Minority Entrepreneurs), and local government (City of Portland).

Representative comments include:

- "Cleaning the river can provide near-term job opportunities for the local job sector, and a clean river will provide increased economic opportunities by reducing economic uncertainties and promoting development along the river. EPA's Workforce Development and Training Program provides a means to enable and enhance these opportunities, such as though grants for programs that "recruit, train, and place local, unemployed and under-employed residents with the skills needed to secure full-time employment in the environmental field". The City values and supports diversity and is dedicated to advancing equity in public contracting by increasing opportunities for State of Oregon certified Minority, Women and Emerging Small Business enterprises (M/W/ESB). We encourage and support the use of strategies that promote the use of M/W/ESB contractors and mentoring opportunities between large and small M/W/ESB firms. The City has set a goal of 20 percent of PTE awards for prime consultant and sub-consultant contracts to State of Oregon certified M/W/ESB firms. We would like to see performing parties set similar targets for the work that lies ahead. The City appreciates EPA's ongoing efforts for workforce development. However, given the magnitude and complexity of the Site, the City requests that EPA use the opportunity to expand the job development program, and provide additional resources specific to Portland Harbor for local work force training. The City would also like to see every action possible in the ROD to ensure that local companies have preferential treatment in the contracting process in all stages of the cleanup."
- "We ask that MWESB firms are given the same info, chances, incentives, and encouragement to work on the project(s) in partnership with the Contractors hired by you."
- "The ROD should include a mechanism for local workforce training and hiring to ensure resources spent on mitigation efforts can have a positive employment impact on the communities most affected by the contaminated site."

- "EPA and DEQ should aim to offer economic benefits from remediation, such as employment and training opportunities, to the local community."
- "I would like EPA to encourage the large companies that will be making millions of dollars coming into Portland, as well as the large industries here that will be working on the project, require them to provide apprenticeships and job training for local community members."

EPA Response

EPA expects that the cleanup work will be conducted by the PRPs under oversight from EPA and the Oregon Department of Environmental Quality (DEQ). EPA will encourage the PRPs and their contractors to hire locally but cannot require parties to do so. EPA will be using contractors to support the agency and aid in the oversight of the design and construction activities. These contractors have federal contracting goals related to the use of small businesses as well as businesses owned by minorities, women, and veterans and EPA strives to use these firms whenever possible.

Additionally, EPA is often able to provide job training and employment opportunities for people living in communities affected by Superfund sites through the Superfund Jobs Training Initiative (SuperJTI) program. EPA's goal through the SuperJTI program is to work with all communities affected by the Site (including communities with environmental justice concerns) to develop job opportunities that remain long after construction is complete at the Site. EPA is already exploring how SuperJTI could be applied at the Site.

2.2.3 Move Quickly and Don't Delay Cleanup

Comment Summary

A total of 740 comments were received that urged EPA to move quickly and not delay the start of the project. Almost all (about 97 percent) were received as post cards (or a few emails) that stated "*I urge the EPA to implement a plan that moves quickly and sustainably reduces contaminants causing harm to Willamette and Columbia River resources.*" Several comments expressed the sentiment that delaying cleanup would just end up costing more, and it was also stated that the pursuit of perfection should not be responsible for delaying cleanup.

Representative comments include:

- "The cleanup of the rivers effects so many life forms that it should be a high priority to complete quickly! Not 5 years down the road, Not 10 years down the road. This known problem needs immediate attention and the funds we pay should be directly applied for an urgent solution. The longer we delay the slow process to resolve, the more work there will be to correct."
- "The longer it sits undone, the dirtier and HARDER to clean it becomes!"
- "It is important that we act as soon as possible so we can minimize the cost and prevent permanent damage."
- "If the cost is too much now, how much will it cost later?"
- "Recognizing the complexity of the cleanup, and the instability of the geological structure, the immediate target should be taking action - Not Perfection."

- "We do need something to happen and I would hate for this to drag out any longer, I'd like to see something done as soon as possible but I would like a more thorough job of cleaning up the mess. That's what's most important I think, not running blame but getting this cleaned up."
- "The process for developing a plan for cleanup of the Site has dragged on for many years. On one side we have those demanding perfection and only perfection and on the other side those anxious to complete the process as quickly as possible at lowest cost. HOWEVER MOST IMPORTANT IS THE NEED TO MOVE BEYOND THE YEARS OF PLANNING AND DISCUSSION AND BEGIN THE CLEAN UP PROCESS AS SOON AS POSSIBLE WHILE CONTINUE MONITORING TO TRACK IMPROVEMENTS AND THE NEED FOR FUTURE ACTION."
- "We should have already started, if not completed, this project. We're slowing our own city's growth and stopping it from flourishing like it could by not getting this resolved."

EPA Response

EPA understands the public's frustration regarding the duration of remedial investigation, feasibility study, and remedy selection. At very large and complex sites, with multiple PRPs, governmental agencies, and tribes such as Portland Harbor, the process does take a number of years. It has taken many years to characterize the nature and extent of contamination over the length of the 11-mile Site and to screen and thoroughly evaluate the potential options for cleanup in order to develop a proposed plan for cleanup. However, the public should be assured that, once a ROD is signed for the Site, EPA will move quickly to initiate next steps with the PRPs toward remedial design and cleanup. We trust the PRPs will want to proceed with the cleanup process. Working with the PRPs, state, tribes, other federal agencies, and the public, we can forge a game plan to move the design and construction process forward expeditiously. However, if an agreement cannot be reached, EPA has enforcement tools to allow the cleanup process to proceed unilaterally if necessary.

2.2.4 Cleanup Will Take Too Long

Comment Summary

Twenty-two personal comments were received that focused on the length of time to complete cleanup – essentially that the estimate of 20 to 30 years was too long. One commenter stated there were ways to reduce cleanup time and spoke of efforts by the Cathedral Park Neighborhood to assess community sentiment on length of time for cleanup.

Representative comments included:

- "Waiting a generation to see if fish are safe for eating is unacceptable."
- "A 30-year cleanup plan duration exposes the public and the environment to health hazards for too long."
- "What we need is a plan that isn't going to take 20 or 30 years."
- "I am concerned that the draft for the Portland Harbor cleanup is proposing a partial rather than full clean up, and is proposing an overly long time frame for doing the work. Even though we warn people currently not to eat fish in the lower Willamette, people still do. We should work quickly to make the river cleaner so the fish can be eaten without harm."
- "The timeframe suggested by EPA is that the cleanup under Alternative I will take up to 30 years. How is such a timeframe appropriate when the river has been imbued in places with toxic

contaminants for many decades? This is not well explained in the rationale for Alternative I. The US EPA should select or develop an Alternative that gets the job done in a more timely manner. Should the residents of Portland or river users be subject to increased toxic exposure just so one of the PRPs can save a few dollars over time? EPA should develop an approach that gets the job done more quickly, and reduces risk more rapidly. This is a very basic exception that benefits a wide range of people and wildlife."

- "Thirty years is far too long to achieve full usability of the river, as well as to remove the fish advisory."
- "Time to completion is a function of a number of variables. For example, The Cathedral Park Neighborhood, in conjunction with the graduating class of Urban Planners at PSU in the year 2015, conducted extensive polling, canvassing, and charrettes among the neighborhood to determine that residents favored accelerated cleanup and its negatives over a longer period of moderate activity. This choice was influenced by a minimal awareness of ongoing channel dredging by the Port of Portland. Additionally, multiple sites can be worked simultaneously. This has the potential to shorten the duration of the project. In the short term, workers, community, and the environment all benefit from a real time, interactive web site. Air quality needs 24 hour monitoring to protect all parties. Cofferdams, de-watering barges, hydraulic dredging, and environmental bucket dredging all serve to minimize impacts on the water column. Special consideration needs to be paid to volatizing PCB's."

EPA Response

EPA understands the frustration with the timeframes for cleanup to achieve its objectives. It will take time. However, because there are sensitive species, such as migrating salmon, that use the Willamette River, there are constraints on the time that physical activities for cleanup can take place in the river. Currently, the "in-river work window" approved by the state and federal resource agencies is approximately between July 1 and October 31, based on actual fish migration observations. Additionally, there are also constraints on the number of dredges, barges, and other equipment that can be used so there is not unacceptable interference with commercial, industrial, and recreational uses of the river. With these constraints in mind, physical cleanup activities, such as dredging/disposal and capping, are expected to take 13 years to complete after remedial design, assuming it is conducted continuously under those constraints.

Once the physical activities of the cleanup are complete and the highly contaminated areas are removed or capped, contaminant concentrations in sediment will be greatly reduced. There are multiple areas that will be cleaned up over the course of the 13 years of construction. Progress will happen incrementally, and at the conclusion of all the construction, EPA expects that 85 percent of the fish consumption risk is projected to be addressed. At that time, restrictions on resident fish consumption from the river (which is currently not advised) will be reevaluated and relaxed if protective. Therefore, there would be measurable improvement directly after construction. Accelerating this timeline significantly probably will not be feasible due to the constraints described above. Immediately after construction of the selected remedy, it is estimated that wildlife will be able to safely consume prey from within the Site since all non-cancer risks on a site-wide scale will be addressed. It is estimated that bis(2-ethylhexyl) phthalate (BEHP) will be at a hazard quotient (HQ) of 5 at a river mile scale and 3 at an SDU scale, very close to the target of 1 and well within potential calculation variances.

The remaining risk to people eating fish is expected to decrease over the following years as natural recovery takes place. If EPA determines that the cleanup, including the natural recovery component, is not occurring as expected, additional cleanup actions may be taken to reach the cleanup levels.

However, in consideration of public comments that sought more cleanup and more certainty of achieving cleanup goals, EPA has selected a cleanup that addresses more contaminated sediment by dredging and capping, which upon the end of construction, gets the sediment much closer to the cleanup levels. Thus, it is expected to take less time for MNR to work. Because the selected remedy involves more dredging and capping, the construction timeframe has increased from 7 to 13 years.

2.2.5 The Community Needs Accurate Cleanup Costs

Comment Summary

Nineteen comments were received that addressed the accuracy of costs derived for the feasibility study. Half were included in form emails and stated:

- "I urge EPA to get their cost numbers right so Portlanders are educated about the costs of cleanup and its benefits. The cleanup of the Portland Harbor arrives at a time that our city is growing and we face many critical affordability issues. We need a final cleanup plan that relies on accurate cost estimates and remains cost-effective."

The remainder were personal comments and included a belief that costs were underestimated, unreliable, and overly optimistic. It was also clear that the commenters believed that the costs presented in the feasibility study and proposed plan were intended to be actual cleanup costs.

Representative comments include:

- "We are concerned about the ultimate cost of cleanup and ensuring that the true costs and benefits are transparent to Portlanders. We believe some of EPA's cost assumptions are overly-optimistic and resulted in a final price tag that is not accurate."
- "We believe some of EPA's cost assumptions are overly-optimistic and resulted in a final price tag that is not accurate. Our livelihoods depend on providing accurate cost estimates."
- "We believe that the cost estimate of the preferred alternative ($746 M) issued by EPA dramatically understates the true cost of performing the proposed remediation, which will likely be more than $1.5 billion. It includes a number of unrealistic assumptions: (1) 24/6 dredging; (2) seamless dredging with no breaks to reposition barges between cleanup areas, install sheet pile walls or account for unforeseen circumstances; and (3) availability of necessary dredge and barge equipment during limited fish windows. Furthermore, it is unclear how the agency was able to cut its prior cost projections in half in a matter of months while changing little in the way of cleanup action. EPA's preferred cleanup alternative needs to be cost-effective and proportional to realistic assessment of the benefits that will justify the significant diversion of resources to cleanup actions. It is imperative that EPA recognize and considers these important economic impacts."

EPA Response

EPA recognizes that the intended purpose and use of cost estimates during a feasibility study for remedial alternatives may be misunderstood by those not familiar with the Superfund process, leading to the incorrect perception that feasibility study cost estimates are "inaccurate" or not the "true" costs. The stated purpose for feasibility study cost estimates in EPA's "*A Guide to Developing and Documenting*

Cost Estimates During the FS" (USEPA 2000) is to compare remedial alternatives during the remedy selection process.

The information provided in the cost estimate is based on the best available information regarding the anticipated scope of the remedial alternatives, and thus the issue may be the technical assumptions and not the costs that they reflect. The stated accuracy in the 2000 guidance for feasibility study cost estimates at the detailed analysis phase is +50 to -30 percent of actual cost. The estimates were accurate for the level of detail and scope of the alternatives development in a feasibility study. The cost estimates are developed to reflect the understanding of the alternatives as described in the feasibility study given the understandable uncertainties that exist and will continue to exist even after a decision on a remedy approach is made, prior to design and construction.

The cost estimates were reviewed by EPA's National Remedy Review Board (NRRB). The NRRB reviewed the feasibility study cost estimates in November 2015 and indicated that the costs presented were generally in the range of costs at other contaminated sediment Superfund Sites (AR Doc#100001536). The NRRB, while determining that the costs used were reasonable when compared to other contaminated sediment Superfund sites, did recommend further evaluation of specific assumptions and related costs. EPA reviewed comments pertaining to cost estimates and made changes to assumptions for all alternatives and updated the cost estimates, as appropriate, to better reflect the anticipated scope of a future remedy for the Portland Harbor Site as it became further defined between November 2015 and the 2016 drafts of the feasibility study reports. For instance, EPA reviewed assumptions pertaining to treatment of contaminated sediment for consistency with early actions and also reviewed unit costs for remedy components such as capping and dredging to reflect consistency with the productivity rates anticipated in EPA's evaluations.

Although there is a perception that the remedial alternatives did not really change between November 2015 and June 2016 because the components used were similar, there were significant changes in assumptions related to quantities of the components (such as, reduced depths of dredging, reduced quantities of sediment treated prior to disposal, reduced extent of river requiring mitigation). Reevaluations of these assumptions, specifically due to more refined development of the alternative's scopes, resulted in lower overall costs in the feasibility study presented in July 2016 than as presented to the NRRB in November 2015. EPA's position is that the cost methodology and sources used in the feasibility study report (USEPA 2016b) meet the stated accuracy range. This reevaluation of cost was reasonable given the significant changes in assumptions made for remedy components within the alternatives. In addition, per the feasibility study cost guidance, EPA uses cost factors for professional and technical services as well as contingency factors to account for unknown or unforeseen conditions that can affect the total cost. Detailed cost backup and individual cost summaries for each alternative presented in Appendix G of the feasibility study report meet the documentation guidelines presented in Chapter 6 of the 2000 guidance.

2.2.6 Cleanup Will Create Economic Impacts for Local Businesses

Comment Summary

Eighty comments were received that focused on short-term impacts to local businesses and the economy during cleanup. They were all personal comments that were part of letters received from the Portland residents and the business community. Commenters feared that the impacts of the cleanup on local businesses (loss of customers and revenues) and resource users (loss of access) during

construction were unacceptable. Many of the commenters appeared to believe that large portions of the river would be shut down or impeded by dredging or other intrusive activities for a long period of time.

Representative comments include:

- "To see (the Willamette) torn up for decades because of a restoration project that is not really necessary would only serve to hurt the city's economy. I would not continue to visit the area while it was an active construction zone. Not only will EPA's plan hurt out economy in terms of businesses losing money, but it will also trickle down and have negative impacts on our residents."
- "The Willamette and the waterfront are essential parts of what makes Portland a great place to live and also a great place to visit. A project like the dredging proposed by EPA could not help but have a negative impact. Years of dredging and construction activity would destroy what makes the waterfront attractive. I'd have to seriously reconsider if I wanted to keep going there, especially if it were noisy. I'm sure other residents and tourists would feel the same."
- "If I owned a business on the riverfront, I wouldn't enjoy having loud, heavy machinery outside my building twenty-four hours a day, and I'm sure it will affect business for the worse. This dredging project could be going on for decades, which is overboard and unnecessary. Businesses that had nothing to do with contaminating the river in the first place should not have to pay such a steep price. EPA should consider an alternate plan, based on advice from people and businesses in Portland."
- Keeping dredging machinery in virtually constant operation for years means the river will be closed most of the time. A good friend of mine runs the Portland Kayak Company, and his business would be completely finished if that happened. Indeed, it would mean disaster for Portland's entire shipping industry."
- "It would affect businesses tremendously and many would likely shut down. People would probably not make the extra effort required to travel to the affected businesses if the easiest routes were blocked. If areas of the river are closed, businesses that rely on it would suffer, and when one area of the economy is affected, all areas are affected. This dredging plan is significantly more strict and expensive than what has been performed in other areas with similar contamination."
- "The ROD should affirm that seasonal timing would be considered to account for busier and slower period of business, facility operations, and prevent adverse economic impacts."

EPA Response

EPA appreciates the concerns of river users about the impacts of the dredging and other construction components of the cleanup. EPA's decision-making process considered such impacts in its evaluation. The need to balance disruption of recreational and commercial use of the river while addressing risks to fish consumers and the wildlife and fish that live in the river has been considered in EPA's evaluation of the alternatives and will be an ongoing consideration as the selected remedy is being designed and constructed.

The selected remedy addresses approximately a 10-mile stretch of the lower Willamette River, consisting of approximately 2,167 acres. However, active cleanup would take place in smaller areas that make up approximately 394 acres, or about 18 percent of the Site. The amount of time cleanup activities

may occur in the river is likely to be constrained to within the in-river work window that will be coordinated with state and federal resource agencies but may be as short as, July 1 to October 31. Cleanup activities will take place within these localized areas at different times throughout the construction period, as determined during remedial design. As such, portions of the river will be inaccessible for some portion of the construction period, but other portions would remain open.

Cleanup activities, including the use of dredges and barges generally should be consistent with existing uses of the river in terms of the level of noise, lighting, and human activity. During the construction period, there would be increased barge traffic as barges transport dredged material from the active cleanup area downstream. Cleanup activities with the potential to restrict navigation in the harbor channel will be coordinated with the U. S. Army Corps of Engineers (USACE), U.S. Coast Guard, and other stakeholders during remedial design.

EPA recognizes the need to attempt to minimize interference where possible with commercial, industrial, and other uses of the river and will take into consideration those operations and constraints during remedial design and construction. EPA and the performing parties will work with landowners and businesses to minimize impacts, such as berthing disruption, through the design and implementation of the remedial actions. Seasonal timing will be considered to account for busier and slower periods of business if possible, but would not supersede other timing required by ARARs, like in-river work windows for protection of listed species.

During construction, areas with active cleanup activities will be inaccessible for the duration of cleanup in that portion of the river. Placement of caps in some nearshore areas may result in permanent restrictions on the use of anchors, spuds, and other equipment in order to protect the caps. However, existing industrial uses and commercial shipping within the Portland Harbor Site already limits accessibility for recreational users in many of these areas. Section 2.2.1 of this responsiveness summary contains more information on economic benefits of the cleanup on the regional economy, jobs, and development of idle properties along the river.

2.2.7 Cleanup Will Cause Local Taxes and Utility Rates to Rise

Comment Summary

A total of 188 comments were received that suggested that utility rates and/or taxes would rise as a result of the cleanup. About 65 percent of these were in the form of a pre-printed postcard that stated:

- “Please accept my comments to the PH Superfund proposal released by EPA in June. As an employee of the Greenbriar Companies, I am concerned that the plan is too extreme. It negatively impacts our company's operations and will increase my own utility bills and water/sewer fees.”

The remaining comments were personal comments from local businesses or residents, expressing hardships they would feel if taxes and/or utilities increased. Representative comments from businesses include:

- “If EPA approves a big, expensive cleanup, I am worried that it will lead to higher costs for small companies and Oregonians. We also have utilities who will pay part of the cost and I’m worried a big cleanup bill would lead to higher utility bills. Thank you for recognizing that there is a real cost to employers for this cleanup. And thank you for everything you’re doing to protect our river. It’s a terrible idea to approve a cleanup plan that may hurt jobs and is so expensive.”

- "I am the President of Gann Brothers Printing, a third-generation printing company that has been in Portland for 115 years. Raising taxes and utilities to pay for a billion-dollar cleanup would kill us. Most of our machines are run by electricity. During the summer, our electricity bills run close to $500 a month; during the winter, they run close to $800 a month. We can't afford them to go up. Higher operating costs make it even more difficult to compete with national companies like Vista print."

- "As a small business owner, I can tell you that this plan will harm individuals and the economy as a whole. I'm a partner at Barbo Machinery & Supply. Today, there are six of us working here. If business taxes rise to fund this project, salaries will have to be cut. We do our best to project our budget out for two to three years, but that kind of hidden tax isn't good."

Representative comments from residents include:

- "As a retired person on a fixed income, I am already paying enough money to the city of Portland as it is. I don't want to be forced to pay any more in taxes because of the cost of this project. I'm in favor of a lower-cost alternative, but Portland residents need to have their voices heard."

- "Increasing taxes to complete a project that doesn't guarantee resolution is not a project many will support. When you live on a fixed income like my wife and I, every single dollar counts. I can't wait to get my big 2.5 percent social security raise next year. That should tell you just how much every penny counts for taxpayers. It costs me $4,200 a year just to live in my own house, and that doesn't include insurance, the water bill, sewer, or anything else. We just plain don't have the extra money to pay for something that will not fix anything."

- "The huge cost of EPA's plan would take too much money out of the economy that we just don't have. This plan would result in higher taxes for Oregon residents. I am retired, but my husband still works. We can't afford any more taxes, period. If taxes were to increase, my husband and I would have to sell our home."

EPA Response

EPA's two threshold criteria for selection of a Superfund remedy are: (1) overall protection of human health and the environment and (2) compliance with the substantive applicable or relevant and appropriate requirements of federal and state environmental laws. Once these two criteria are satisfied, EPA determines the best balance of tradeoffs among the alternatives with respect to balancing criteria, one of which is cost, and modifying criteria (which includes a wide spectrum of often competing concerns). Cost estimates developed for the cleanup will be refined during the remedial design phase. Within the context of the Superfund statute and regulations, the sources of funding for remedy design, construction and maintenance are not within the scope of criteria that EPA can consider in making remedy decisions, and EPA cannot address questions of funding or liability in any detail at this time.

Over 150 parties have been identified as potentially responsible for the costs of investigation and cleanup of the Site. Some public utilities and the city and state are included in that group. PRPs may seek to pass some of the cost on to their customers, resulting in higher utility bills. It is unclear at this time to what extent this will occur. EPA intends to request all PRPs to participate in funding and performing the cleanup, which will spread the cost amongst many parties.

2.2.8 Implement the Cleanup Safely

Comment Summary

Twenty personal comments were received on this topic. Commenters were interested in ensuring that the remedial action be completed as safely as possible. Their primary concerns centered on endangering the health of local residents and workers through the release of contaminants to the air and endangering environmental health via release of contaminated sediments while dredging. Suggestions included air and water monitoring, best management practices, meetings with the community, consultation with the University, and others. It was stated that EPA should require use of best practices to avoid off-gassing and volatilization of toxic substances, and ensure that workers are trained in these practices. Thoughts for the remedial design included that EPA should require dredging by environmental/closed buckets and specification of which near-shore areas should be dredged within sheet pile (or other effective) enclosures.

Representative comments include:

- "As specified in "Common Elements of All Alternatives" it will be important for the remedial design plan to require dredging by environmental/closed buckets to minimize release of contaminants to the water column (Plan, p. 28). Likewise, depending on contaminant concentrations and mobility, EPA's final plan should specify which near-shore areas should be dredged within sheet pile (or other effective) enclosures so that resuspended contaminants are not dispersed to surrounding river areas. "
- "This needs to be organized by existing coalitions who must insist on coordination between local, state and federal authorities. These entities must insist on air and water quality monitoring while this dredging takes place until the contaminants are safely transferred to a toxic dump location well moved from our fish and water resources. The safety of these workers and impacted neighborhoods need to be attended to until the contamination is removed. "
- "During the entire length of cleanup process, require the most effective fuel/emissions filters available and ongoing monitoring to minimize exposure for all cleanup-related activities, including but not limited to freight, dredging, barges, and other equipment. If air toxins are found to exceed acceptable levels, immediately take measures to intervene. Ensure the health and safety of people and the environment in the transport and disposal of toxic substances Do NOT dispose of contaminated sediment in a way that will negatively impact the health of people living or working near the disposal site. Use known best practices to avoid off-gassing and volatilization of toxic substances, and ensure that all workers are trained in these practices."
- "Atmospheric release of polychlorinated biphenyls (PCBs) is not included in the EPA analysis or proposed plan. Inhalation of PCBs during the remediation process can cause harmful health effects in people. The proposed plan should address and include air monitoring during and after the removal and remedial actions."
- "The contaminants need to be removed using the utmost caution so as not to contaminate North Portland's already unhealthy air even more. Air monitoring is imperative while dredging is going on."

EPA Response

EPA is focused on protecting the health and safety of local residents and workers and minimizing potential impacts to the environment throughout remedy implementation. During implementation of the cleanup, worker safety requirements must be complied with, and water quality standards will be met. Air emissions, if any, will be monitored as necessary.

During the remedial design, site-specific plans will be developed to address potential issues and document best management practices and other procedures for protection of human health and the environment. Health and safety plans by parties performing the work are required to be put in place. Plans will be developed for conducting air and water quality monitoring during dredging and other activities with the potential to release contaminants. Air monitoring will be conducted at the work area and along its perimeter likely at the outset of work and where necessary as work continues. Water quality monitoring will also be performed during dredging and other in-river activities, which might include turbidity, chemical, and other monitoring. In the unlikely event that unacceptable levels of contaminants are detected, operations will be stopped and measures will be taken to promptly address such releases.

Contingency plans outlining corrective actions that will be taken to correct damage to the environment due to accident, natural causes, or failure to follow procedures will also be prepared. Methods for implementing green and sustainable remediation practices (such as, reduce vehicle emissions and fuel consumption, maximize efficiency of material transport/disposal, promote recycling, and analyze haul route proximity to schools) will also be developed during remedial design which will help to minimize impacts to the community.

2.2.9 Improve Opportunities for Public River Use

Comment Summary

Thirteen comments were received regarding public access to the river, and all requested that access be improved to make recreation easier as part of the cleanup. About half were received as part of a post card mailing and stated:

- "More access points should be created to make recreation on our river easier."

The remainder were personal comments. One person referenced the increased access created by the installation of the Big Pipe upriver and other people believed that the PRPs currently limited access and that EPA could improve that situation.

Representative comments include:

- "There are opportunities to enable people to get to the Willamette River, and utilize what it has to offer at multiple properties along the Portland Harbor stretch. One of the main constraints to access has been the unwillingness of some landowners to enable to public to gain access to the river. We feel that there are opportunities that are inherent in the development of the cleanup process, and that can be prescribed in the ROD, that can enhance and improve access at multiple sites along the river."
- "Improved River Access. As part of the remedy EPA should include provisions for improved access along the river. There are opportunities to enable people to get to the Willamette River, and utilize what it has to offer at multiple properties along the Portland Harbor stretch. One of the main constraints to access has been the unwillingness of some landowners to enable to public to

gain access to the river. We feel that there are opportunities that are inherent in the development of the cleanup process, and that can be prescribed in the ROD, that can enhance and improve access at multiple sites along the river."

- "Public Access: Increase access to public lands along the river. Prioritize impacted communities – including youth – in the design, cleanup, restoration, and development of new sites."
- "The installation of the Big Pipe upriver has allowed a group of us to safely swim in the Willamette River for the past three years. As part of the Human Access Project we support conservation, education and stewardship of the Willamette River and its entire watershed. We are thrilled to be able to access at least parts of the river already."
- "Cleanup actions should support improved human access to the river where it is consistent with ecological and economic needs."

EPA Response

CERCLA authorizes EPA to take response actions to address risks to human health and the environment from releases or potential threats of releases of hazardous substances. In general, EPA does not have authority to require permanent public access through privately owned land or to specifically develop additional public access points because such requirements generally are not related to reducing risks to people or ecological receptors. However, EPA's experience at other Superfund sites is that either during or after remedy implementation, there may be opportunities to enhance access of future use beyond what would be required by the selected remedy, which can be discussed. EPA will ensure that the design of the remedy accommodates reasonably anticipated future uses to the extent possible while still achieving all cleanup objectives, including public access areas where owners and municipalities plan for such access.

2.2.10 Address Concerns of Sauvie Island Residents

Comment Summary

Comments were received from members of the Sauvie Island Grange. The comments asked that EPA address the concerns of the local inhabitants of Sauvie Island about the effects of Site contaminants from upstream on their drinking water wells and on the parts of the Willamette River along Sauvie Island that are used for docking houseboats and for recreation. The letter also expressed concerns about effects that are short and long-term downriver of the Site and states that there is existing contamination.

EPA Response

EPA shares commenters' concerns about providing for a remedy that addresses risks to the health and well-being of everyone who lives near or uses the Willamette River. The selected remedy extends downstream to river mile (RM) 1.9 and fronts a portion of Sauvie Island. The remedial investigation report (USEPA 2016a) summarizes the nature and extent of contamination within the in-river portion of the Site. The report includes the baseline human health and ecological risk assessments and identifies the higher risk areas along the Willamette River.

During the remedial investigation, sediment samples were collected from river miles 0 to 3 along Sauvie Island as well 1 mile downstream within the Multnomah channel. These investigations can be found summarized in Table 5.6-2 and Section 2.1.4.1.8 of the remedial investigation report. Further, sample locations and results are summarized on Figures 1.2-6a-b to 1.2-18a-b of the feasibility study report (USEPA 2016b). While the samples taken along Sauvie Island do not cover the entire extent of the Island,

the samples represent portions of the island closest to the upstream contamination and therefore more likely to have higher contamination levels. Based on the sample results, the areas bordering Sauvie Island were determined to have a much lower risk than the upstream areas identified for further cleanup and feasibility study analysis.

Specifically:

- EPA collected fish samples from downstream of the study area (river mile 0 to 1.9) and in the Multnomah Channel and did not find contaminants at levels of concern.
- EPA sampled sediments immediately downstream of the study area in the Willamette River and Multnomah Channel and found some low-level contamination. There was some evidence of contaminant migration from the study area for certain contaminants.
- EPA tested surface water and fond these results, reported in the remedial investigation report (USEPA 2016a):
    - *"Concentrations of contaminants in surface water within the study area are generally higher than those measured in upstream samples under all flow conditions. Elevated concentrations were observed in both transect (cross-river composite samples) and single-point surface water samples at various locations throughout the study area. The highest contaminant concentrations in surface water within the Site were found near known sources. At the downstream end of the study area and Multnomah Channel, concentrations of total PCBs, dioxin/furans, DDx, bis(2-ethylhexyl) phthalate (BEHP), chlordanes, and aldrin in surface water are greater than concentrations entering the study area and indicate that contamination from Portland Harbor is being transported downstream to the Columbia River."*

Based on this information, approximately 1 mile of the Willamette River along Sauvie Island has been identified as part of the Site due to unacceptable risks and is included in the selected remedy for MNR.

EPA's selected remedy will remove contamination as effectively and efficiently as possible by targeting areas with the highest concentrations and risk with active remedial technologies in order to safeguard the communities along the Willamette, including those downstream of higher risk areas.

Regarding concerns about the quality of well water supplying drinking water to the Sauvie Island community, it may be likely that some of the Island's private domestic wells are accessing the same groundwater aquifer. In such cases, test results from a nearby public water system may approximate what the water quality is in a private well. In addition, if a private well has been tested recently by its owner, the results could also approximate neighboring wells.

EPA suggests the community contact the Oregon Health Authority, which is the agency in charge of monitoring community well water supply compliance with drinking water quality regulations. The community can also access information about the water supplies regulated by Oregon Health Authority online at https://yourwater.oregon.gov/.

2.2.11 Address Enforcement Concerns

Comment Summary

Four comments were received that referenced enforcement issues. These included prevention of activities that might compromise the remedy, compliance with fish advisories, completion of existing

actions at upstream sites, PRP issues, and obligations of cleanup for newer small landowners next to or within the Site.

These comments include:

- "Cleaning up is only the start. I want to see ground breaking regulation on our river that prohibits emissions. This means strict regulation - a gatekeeper law - that requires all motorized vehicles traveling the river to be licensed and approved before travel or regulation. This will create jobs and will greatly improve the quality of our river water, thus improving the quality of life."
- "Monitored recovery requires more than signage and fencing along the riverbed, but regular enforcement."
- "Include ongoing pollution controls in the final cleanup plan, including from upriver sources. Do not allow re-contamination from upland sources. Use EPA enforcement authority to clean up major hot spots like Arkema, shut off upland pollution sources, and define an appropriate, diminished role for Oregon DEQ during the cleanup process."
- "How are you going to get someone like that to maybe agree to pay any money toward the cleanup, and what happens when they say 'I'm not going to, I want the state to take care of it, it's their land technically and I want them to pay the bill'?"

EPA Response

EPA will work with state and local regulatory agencies to promote public safety including, enforcement of permits and other regulatory pollution requirements and attempt to prevent activities that might compromise the remedy. EPA's regulatory enforcement programs will continue to work with DEQ on coordinating inspections and enforcement activities as appropriate. Fish advisories themselves are not enforceable; however, EPA will continue to do outreach and education in the community regarding health risks from eating resident fish from the river. To minimize the potential for recontamination of capped/dredged areas, EPA will work with DEQ and use enforcement authorities, if needed, to address known and discovered upstream sources. EPA, state and local agencies will continue to identify and promote cleanup of sources as they are found, whenever feasible.

2.3 ARARs, PRGs, and COCs

2.3.1 Applicable or Relevant and Appropriate Requirements Issues

Comment Summary

Comments specific to ARARs were received from businesses, the Portland Audubon Society, and the City of Portland.

Summaries of those comments are:

- EPA is required to consider ARARs in selecting its preliminary remediation goals (PRGs). Generally, these will be validly promulgated laws or regulations of the state. EPA guidance provides that, when a state has considered federal criteria and adopted different, state-specific standards, the CERCLA process should follow the state standards. However, in this case, instead of giving due consideration to Oregon regulations, EPA appears to have made arbitrary choices to choose more stringent federal standards, without giving any weight at all to the state-specific factors that led Oregon to regulate in a different way (including with respect to Oregon standards

that EPA formally approved!). EPA should correct this in its ROD; in any case where EPA sets a Remediation Goal on the basis of an ARAR, that ARAR should be the applicable Oregon standard.

- If a state has promulgated a numerical [water quality standard, or "WQS"] that applies to the contaminant and the designated use of the surface water at a site, "*the WQS will generally be applicable or relevant and appropriate for determining cleanup levels, rather than [the NRWQC]. A WQS represents a determination by the state, based on the [NRWQC], of the level of contaminant which is protective in that surface water body, a determination subject to EPA approval*." (Emphasis added.) 53 F.R. 51394, 51442 (Dec. 21, 1988, explanation of revisions to the National Contingency Plan).

- EPA's proposed plan has chosen to ignore this aspect of Oregon's beneficial use designation and has apparently decided instead that any groundwater discharging to the river needs to meet this standard at any sampling point within that groundwater, not taking into account either what the concentration would be in-stream or after conventional treatment, assuming the Lower Willamette River at Portland Harbor is ever used for drinking water (and there are no plans to do that).

- EPA should eliminate all groundwater PRGs because they are not needed to support the RAOs. EPA's proposed plan designates a number of groundwater PRGs on the basis that they are "ARARs." In many cases, these are based on Oregon's surface water quality standards. However, Oregon's water quality standards are clearly applicable to the waterbody itself, not to groundwater. Oregon would certainly take its water quality standards into account in determining whether a discharge of groundwater would impair the surface water body itself, by causing an exceedance of the water quality standard in the surface water, and any cleanup decisions made in Portland Harbor should follow that approach. However, the water quality standards are in no sense "ARARs" as applied to groundwater and should not be made "groundwater" remediation goals.

- To the extent EPA is adopting what it considers to be an Oregon-based ARAR, it can only do so after adjusting the ARAR value to account for what Oregon would determine to be natural background. OAR 340-122-0040 (1)(c).

- At complex sediment sites, it is not feasible to predict the course of cleanup efforts with great certainty or to foresee every possible change in circumstance. At many sites, EPA has therefore incorporated provisions into the ROD for technical impracticability waivers to allow EPA to adapt to circumstances or additional information. Such waivers are site-specific waivers for specific contaminants. EPA has expressly acknowledged that: "Technical impracticability waivers are one of the means of waiving ARARs consistent with CERCLA Section 121(b) and the NCP [Section 300.430(f)(I)(ii)(C)(3)]. Through analysis of site data and demonstration of the impracticability of achieving ARARs…a waiver may be appropriate." *Summary of Technical Impracticability Waivers at National Priories List Sites*, OSWER Directive 9230.24, August 2012, Washington, D.C.

- Per EPA sediment remediation guidance "RAOs should reflect objectives that are achievable from the site cleanup." This leads to one of two possible EPA management decisions: (1) EPA should remove surface water RAOs from the 2016 draft final feasibility study report, given that site sediments are not the primary cause of surface water ARAR exceedances and therefore sediment remedies alone cannot achieve all of the most important chemical-specific ARARs in surface water; or (2) EPA should waive water quality ARARs for these same chemicals in the ROD. EPA

continues to maintain that, "Currently, EPA does not have a basis for waiving any ARARs. Any ARAR waivers would have to be conducted through the remedy selection process and documented in a ROD amendment." If EPA had correctly estimated alternative surface water concentrations (even using the simplistic approach attempted in Appendix K), or simply compared the upstream concentrations to EPA's proposed surface water PRGs, then it would have an obvious available basis for waiving many of the water quality-related ARARs. Instead EPA maintains that site sediment remedies might somehow achieve site surface water reductions below ARARs despite multiple other sources also contributing to those same ARAR exceedances. EPA supports this ongoing bias by conducting obviously flawed analyses, such as Appendix K, and ignoring upstream data and then contending there is no basis for waiving the surface water ARARs.

- The City of Portland requests that EPA provide an explanation of its “ARARs” and “TBC” selection process specifically regarding the following location-specific or action-specific state and local laws. The following laws have been considered ARARs at other cleanup sites in Oregon (for example the Zidell cleanup and the Teledyne Wah Chang Superfund Site). The City requests that EPA explain to the community how compliance with federal standards will protect our community to the same extent as these specific state and local laws:
    - State Historic Preservation Office laws ORS chapters 358 and 390
    - Fish Passage Laws ORS 509.580 through 509.910 which protect fish during and after remedy construction
    - Balanced cut and fill requirements of Portland City Code 24.50 which ensure flood resiliency
    - The Willamette River Greenway laws and Statewide Planning Goal 15, ORS 390.310 and the Greenway requirements promulgated by the City in Portland City Code 33.440 to comply with State law
    - Local noise ordinances that set maximum permissible sound levels and prohibit specific noise disturbances in Portland City Code 18.10 and 18.12
- The Audubon Society suggests that Alternative I fails to meet all ARARs. Specifically, it fails to meet or address the following:
    - State of Oregon Land Use Planning Goal 5 (natural resources), Goal 6 (Air, Water and Land Natural Resources Quality), Goal 7 (Natural Hazards) and Goal 15 (Willamette River Greenway)

EPA Response

EPA disagrees with the comments that request that surface water and groundwater cleanup levels should be removed from the ROD. The human health and ecological risk assessments found that releases of hazardous substances found in surface water and groundwater within the Site pose unacceptable risks to humans from ingestion and bioaccumulation through the consumption of fish and to ecological receptors for direct contact, ingestion, and bioaccumulation through the consumption of prey. Therefore, having been triggered into action, development of RAOs and cleanup levels to achieve those RAOs for both media is appropriate at the Site.

CERCLA Sections 121(d)(1) and (2) require: "*(1) that any remedial action selected shall attain a degree of cleanup of hazardous substances, pollutants, and contaminants released into the environment and control of further releases at a minimum which assures the protection of human health and the environment; and (2) any hazardous substance that will remain onsite, such remedial action shall require a level or standard of control which at least attains Maximum Contaminant Level Goals established under the SDWA, and water quality criteria established under Section 304 or 303 of the Clean Water Act, and any promulgated standard, requirement, criteria, or limitation under a State environmental or facility siting law that is more stringent than any Federal standard, requirement, criteria, or limitation that has been identified to the President by the State in a timely manner and is legally applicable to the hazardous substance or pollutant or contaminant concerned or is relevant and appropriate under the circumstances of the release or threatened release of such hazardous substance or pollutant or contaminant."* 42 U.S.C. § 9621(d)(1) and (2)(A)(i) and (ii).

The NCP provides that *"[r]emediation goals shall establish acceptable exposure levels that are protective of human health and the environment and shall be developed by considering the following: [A] [ARARs] . . . [B] . . . [MCLGs] . . . . [E] Water quality criteria established under sections 303 and 304 of the Clean Water Act . . . ."* 40 CFR § 300.430(e)(2)((i)(A), (B), and (E). As noted in the preamble to the NCP: *"As new information and data are collected during the remedial investigation, including the baseline risk assessment, and as additional ARARs are identified during the RI, these preliminary remediation goals may be modified as appropriate to ensure that remedies comply with CERCLA's mandate to be protective of human health and the environment and comply with ARARs*." See 55 Fed. Reg. 8712, May 8, 1990.

Likewise, to be protective of human health and the environment, remediation levels for some substances may have to be based on non-promulgated criteria and advisories rather than on ARARs, because ARARs do not exist for those substances or because an ARAR alone would not be sufficiently protective in the site-specific circumstances, e.g., where additive effects from several chemicals are involved. Similarly, state criteria, advisories, and guidance should also be considered for the state in which a site is located.

EPA followed the requirements of CERCLA and the NCP and developed preliminary remediation goals, which are now the final cleanup levels in the ROD for surface water and groundwater by looking to federal and state ARARs, including Section 304(a) criteria, state promulgated water quality criteria, (MCLs) and MCL goals (MCLGs). If there was no ARAR, such as for manganese (a groundwater COC), the Regional Screening Level was selected. The cleanup levels based on chemical-specific ARARs for surface water and groundwater are considered protective of human and ecological receptors exposed to the COCs and consistent with the site-specific risk assessments. EPA is required under the NCP at 40 CFR 300.430(e)(2)(i) as previously indicated to consider ARARs to define the PRGs when they set an acceptable level with respect to site-specific factors.

Consistent with CERCLA, the cleanup levels for RAO 3 (surface water/human health) and RAO 4 (groundwater/human health) are based on the lower of the federal National Recommended Water Quality Criteria established under Section 304(a) of the Clean Water Act, Oregon water quality standards, MCLs, and non-zero MCLGs, as presented in Table 2.1-4 of the feasibility study report. On stringency, the NCP preamble notes: *CERCLA requires that remedial actions comply with all requirements that are applicable or relevant and appropriate. Therefore, a remedial action has to comply with the most stringent [emphasis added] requirement that is ARAR to ensure that all ARARs are attained. In addition, CERCLA requires that the remedies selected be protective of human health and the environment and attain ARARs. A requirement does not have to be determined to be necessary to be protective in order to be an*

ARAR. Conversely, the degree of stringency of a requirement is not relevant to the determination of whether it is an ARAR at a site and must be attained (except for state ARARs). (See 55 FR 87841, May 8, 1990.)

As previously indicated, CERCLA 121(d)(1) requires that the remedial action attain a degree of cleanup and control of further releases at a minimum which assures the protection of human health and the environment, contrary to comments that only state standards should be applied, EPA was justified in using the more stringent criteria identified above in lieu of the State of Oregon WQS for COCs in media that relate to unacceptable risks identified in the risk assessments to actual or potential receptors as represented in the RAOs. In some cases, cleanup levels established for COCs in groundwater for ecological receptors in pore water appear to be the federal National Recommended Water Quality Criteria established under Section 304(a) of the Clean Water Act; however, the baseline risk assessment established these groundwater cleanup levels as protective levels for acceptable risk. Thus, EPA has not applied a surface water criterion to groundwater but rather used a risk-based level protective of receptors as defined by the risk assessment to achieve an RAO.

EPA's use of Safe Drinking Water Act MCLs as cleanup levels for COCs in surface water or groundwater is appropriate at the Site and EPA did not ignore Oregon's beneficial use designation, but in fact is protecting the beneficial uses of both groundwater and surface water by applying the SDWA standards. CERCLA and the NCP are clear that MCLs are to be achieved in contaminated groundwater and surface water at a site when relevant and appropriate under the circumstances of the release. MCLs are relevant and appropriate under the circumstances of the release at Portland Harbor because the designated uses of the lower Willamette River include drinking water supply. (Designated Uses for the Willamette Basin specified for the Willamette Basin at OAR 340-041-340 and 340-041-0345.) Likewise, all ground water of the state, including the ground water adjacent to and under the lower Willamette River, are to be protected for the beneficial use of domestic drinking water supply. OAR 340-040-0020(3), which is as stringent or more stringent then the *EPA Guidelines for Ground-Water Classification* (USEPA 1986) (See 55 FR 8732, March 9, 1990). Releases of hazardous substances have occurred to groundwater that is discharging to or under the river within the Site or has the potential to discharge to the river, which exceed relevant and appropriate Safe Drinking Water Act standards for groundwater and surface water cleanup. As noted in the 1991 Role of the Baseline Risk Assessment guidance, exceedances of MCLs and water quality criteria may warrant action under CERCLA. Therefore, it is appropriate for the final selected remedy to set cleanup levels based on MCLs for groundwater and surface water at the Site. Furthermore, CERCLA guidance is clear that where either surface water or groundwater is or may be used for drinking water, MCLs are relevant and appropriate as cleanup standards. Thus, the notation in State of Oregon regulations by the commenters concerning pretreatment requirements is not a limitation on the use of MCLs at the Site. Likewise, under the circumstances at this Site, both groundwater and surface water are potential drinking water resources, and discharges of contaminants to the river represent one continuous pathway. Therefore, there is no basis to distinguish pore water from groundwater or surface water in regard to where compliance with the ARAR should be met. See Response 2.4.3 and EPA's response to LWG Dispute Issue 1m for further response to the legal bases and site-specific reasons why MCLs are relevant and appropriate to releases at the Site and Oregon's designated use regulation is not inconsistent with their use at the Site.

Regarding comments that EPA's cleanup levels should be adjusted for natural background levels in accordance with Oregon Administrative Rules 340-122-0040(1)(c), first that regulation doesn't exist as cited therefore, EPA assumes that the commenter meant Oregon Administrative Rules 340-122-

0040(2)(c). That regulation states: "*(2) In the event of a release of a hazardous substance, remedial actions shall be implemented to achieve: . . .*

> *(c) For areas where hazardous substances occur naturally, the background level of the hazardous substances, if higher than those levels specified in subsections (2)(a) through (2)(b) of this rule."*

EPA's final cleanup levels for the Site, do not conflict with this provision. No cleanup level has been identified by DEQ that is below natural background levels as calculated by DEQ. Also, it is EPA policy to not cleanup beyond natural and anthropogenic background levels. No such background levels have been established for COCs in groundwater and surface water at the Site.

Likewise, EPA does not agree that surface water and groundwater cleanup levels based on ARARs are unachievable, and they should be waived. There has been no information or analysis provided to EPA to date that supports a waiver of any water standard or MCL at this Site. It is EPA's expectation that DEQ's upland source control actions will adequately address groundwater contamination discharging to the river (the plumes) and will protect surface water quality. RAOs for groundwater are focused on containing and reducing migration of COCs from groundwater to surface water and biologically active areas of sediment. Should groundwater not be addressed adequately under DEQ's actions, RAOs for surface water are addressing the risks that COCs in surface water are presenting to human health and the environment. EPA may, at a future time, determine if action is warranted under CERCLA to further address groundwater or surface water contamination. Likewise, if during remedy implementation it is discovered and demonstrated that achieving water quality standards or MCLs in a reasonable timeframe is not technically practicable a waiver for specific COCs that are not achievable for a particular area or areas could be considered. It should be noted that under EPA policy and guidance, a waiver requires significant efforts pre- or post-remedy implementation to document that it is not technical practicable to achieve an ARAR.

EPA has considered the City of Portland codes indicated by commenters as being omissions from the identified ARARs. Neither CERCLA 121(d) nor the NCP requires CERCLA actions to comply with local laws; i.e. local laws in themselves are not ARARs. EPA has determined the suggested requirements are not ARARs for the selected remedy because they are local laws and not otherwise applicable or enforceable state-wide.

EPA has also considered the Oregon Revised Statutes indicated by commenters as being omissions from the identified ARARs. It should be noted that State Historic Preservation Office laws (Oregon Revised Statutes chapters 358 and 390) that were incorrectly indicated by commenters as being omitted as ARARs were in fact identified by DEQ as potential ARARs to EPA and thus are included as ARARs in the ROD.

With respect to state land use goals and Oregon Revised Statutes 390.310 and 509.580 through 509.910 is that for State requirements to be considered as ARARs under CERCLA, the NCP (specifically at 40 CFR 300.430(d)(3)) requires that the support agency (State of Oregon) identify potential ARARs in a timely manner for consideration. EPA worked closely with DEQ during the ARARs identification process and the requirements cited by commenters were not identified by DEQ as potential ARARs. However, numerous federal and state laws for fish and wildlife coordination and endangered species identified as ARARs can address the concerns about fish passage.

For additional information, please also see LWG Dispute Issue 1g, 1m, 1n, 1o, and 1s (Appendix A of this document) and Sections 2.4.3 and 2.4.4 of this responsiveness summary.

2.3.2 Make Unlimited Fish Consumption for All Groups a Cleanup Level and RAO

Comment Summary

This was the most commonly seen comment and almost 3,000 comments were received that stated that the cleanup should result in fish being safe to eat, without restrictions, for any population. About 90 percent of comments received were received as form emails or preprinted postcards that listed a variety of other comments.

Representative comments of this type included:

- "I urge EPA to implement a plan that: Contributes to healthy fish that are safe to eat for all people."
- "The goal of the cleanup must be to end the Fish Consumption Advisory related to pollutants found in the Portland Harbor stretch of the Willamette River for all people. EPA should provide a date by which the advisory will be lifted."
- "The Cleanup Plan must result in removal of Fish Consumption Advisory so that eating fish from the Lower Willamette is just as safe as eating fish from anywhere else in the Willamette River System and this must occur within a 10 to 20-year time frame."
- "EPA should select an alternative that allows all members of our community to eat fish safely from our river, including woman of childbearing age and children."
- "The overall goal of the Superfund cleanup should be to lift the fish consumption advisory for ALL people (including breast feeding women) related to the toxic pollutants found in the Portland Harbor area of the Willamette River."
- "I ask EPA to create a plan that leads to healthy fish that are safe to eat."
- "The overall goal of the Superfund cleanup should be to lift the fish advisory related to toxic pollutants found in the Portland Harbor area of the Willamette River."
- "The final result of the cleanup should be the lifting of the Fish Consumption Advisory related to PCBs for the Portland Harbor area by a specific date."

The remaining 248 comments were received as personal emails, letters, or postcards. Representative comments of this type included:

- "The plan does not go far enough to protect public health concerning the consumption of fish. It is in the public's interest that the river is cleaned up to an extent where advisory warnings can be lifted, and that everyone, including infants and women of child bearing age, can eat local fish. I'm afraid that the CERCLA-based fish advisory program will not sufficiently protect the public, and I advise that the health of the fish that is to be consumed be verified according to the Oregon Health Authority."
- "Many of us in Portland grow some of our own food and are committed to buying local as much as possible. Having access to free, fresh and NON-TOXIC fish is part of that commitment. The plan for sustainable cleanup of the river must include a TIMELINE for WHEN NON-TOXIC FISH caught in our own rivers could be consumed, especially by pregnant women and young children."

- At the very least the fish consumption advisory needs to be lifted at the end of the cleanup. Help ensure that this Osprey can fish for clean fish, and people can consume fish without increased cancer risk!! I'd sure like to know what fish I do eat from the Willamette isn't a threat to my health or that of my family and friends. I know there are lots of people who use this river and its tributaries for fish to supplement their diets and they are living hand to mouth in this economy. Let's do the right thing and clean up this river. It's a black mark on the city of Portland and the PNW which prides itself on being eco and clean!"

- "Communities who fish the river for sport, support, or tradition can safely eat only a limited amount of their catch (8 oz. per person per month), while children, the elderly, nursing & pregnant mothers and others at risk are prohibited from eating any fish caught in the area. People who depend on Willamette River fish for dietary protein have increased cancer risk."

- "Navigable rivers belong to all of us. If I dumped poison in the river, I would be held responsible. We'll know the river is clean enough when the Fish Consumption Advisory can be lifted, and we need to know when that can be reasonably expected to happen."

- "Some people rely on the river for their subsistence. Now, they regularly exceed the Oregon Health Authority's recommendation of eating more than 8 oz PER MONTH even though it could be deleterious to their health because they can't afford healthier choices. EPA MUST set a certain date and measurements so fish from the Willamette are safe to eat again!"

- "As the most vulnerable members of our community eat fish from the Willamette, it is also important for the plan to provide a firm date when the Fish Consumption Advisory will be lifted and hold those liable responsible for hitting that date, with risk of meaningful fines. Fish should be regularly tested for contaminants to ensure that the Advisory will be lifted on time."

EPA Response

Within the Site, persistent contaminants (particularly PCBs, chlorinated pesticides such as dichlorodiphenyltrichloroethane [DDT], and polychlorinated dioxin and furans) from sediments and surface water bioaccumulate in the food chain, resulting in higher concentrations of the contaminants in fish tissue than in sediments. Existing Oregon Health Authority fish consumption advisories apply to all resident fish at the Site, including carp, bass, and catfish, advising none of these fish be consumed by children under age 6, women of childbearing age, and people with thyroid or immune system problems and no more than 1 fish meal per month for everyone else. There is no advisory for consumption of migratory salmon because these fish do not reside at the Site long enough to bioaccumulate the contaminants in their tissue to levels of concern as determined by Oregon Health Authority. Fish advisories once cleanup has achieved its goals, though less restrictive in the future, may need to remain due to broader watershed issues.

EPA's risk assessment process evaluates cancer and non-cancer risks based on a reasonable maximum exposure that could occur at the Site, and it is reasonable to look at a subsistence level of fish consumption at this Site given the reserved tribal treaty rights and known amount of fishing that immigrant communities in Portland do.

During implementation of EPA's selected remedy, fish could be exposed to increased levels of contaminants from sediments being disturbed by dredging and capping activities. During construction, people would be advised to eat no more than 0.6 fish meals per year or 4.8 ounces per year (considering

an 8-ounce fish meal) for most populations and 0.1 fish meals (8 ounces per year) for women who may breastfeed. This advisory would be in place for the 13 years of construction of the selected remedy.

After all active remediation being proposed for the selected remedy is completed, EPA estimates that the temporary construction fish advisory would be relaxed to allow for 16 fish meals every year to be safely consumed from the Site for most populations at completion of construction and 1 fish meal per year for women who may breastfeed.

The selected remedy addresses all risk to ecological receptors from eating fish and will result in substantial risk reduction for human fish consumers, but it likely will not be possible to reduce the concentrations of PCBs and other contaminants to levels low enough to allow for consumption at the higher consumption rates associated with subsistence fishing. Upstream of the Site, background levels of PCBs from "clean" areas exceed the acceptable range based on conservative risk estimates. Therefore, fish advisories would remain in effect following the cleanup but would be less restrictive because the highest concentrations of bioaccumulative contaminants in sediment would be removed or capped such that they no longer enter the food chain within the Site. Watershed-wide implementation of source reductions through water quality programs by the DEQ in conjunction with source control activities at the Site are expected to contribute to the elimination of fish consumption advisories over time. Fish advisories due to contamination at the Site would be modified based on the results of long-term monitoring of contaminants in fish tissue and fish tissue surrogates (like passive monitoring where necessary). Although CERCLA-related fish advisories would remain in place until final cleanup levels are achieved, Oregon Health Authority may still impose an advisory based on broader watershed risks. Because these contaminants can pose risks even when the concentrations in the environment appear quite low, it is critically important to remove these persistent pollutants from the environment.

2.3.3 Acknowledge that Safe Fish Consumption at All Levels Is Not Supportable

Comment Summary

One commenter wrote that the goal of unlimited fish consumption was at odds with federal guidance from other agencies. Specifically:

- "EPA's water quality goal for the Willamette is that a person could eat fish from the river as their main source of food for twenty years without any ill effects. This might be a good goal, but it is an extremely unrealistic one for an urban river. Not only that, but such a diet would far exceed what another branch of the government, the FDA, safely recommends. The standard that EPA has set is impossible to reach."

Two other commenters spoke to concentrations of mercury in fish that are not related to the Superfund issues at the Site:

- "The WWC struggles with the expectation that the targeted cleanup levels can actually be achieved in an urban waterway. EPA uses remediation levels that do not adequately consider sources of contaminants coming into the system, from upstream of Portland Harbor. After cleanup, fish advisories will remain in the Lower Willamette, given the ongoing need for mercury advisories that are established by the Oregon Health Authority and unrelated to sources within the Harbor."

- "None of the cleanup alternatives evaluated by EPA will allow all fish advisories to be lifted since none will lower the risk posed by the background mercury content of resident fish at the Site.

Mercury impacts are watershed-wide and cannot be addressed by any remedy performed at the Site. To date, EPA has done little to challenge the public misperception that remediation of the Site will allow all fish advisories to be lifted."

EPA Response

EPA's mandate under CERCLA is to select remedies that are protective of human health and the environment. EPA generally will not require cleanup beyond background levels of contamination and is not doing so in the selected remedy. One of the designated uses for the Willamette River is fishing, and EPA does not consider other health issues that might exist around such use in making its remedy decisions. Fish consumption advisories will be less restrictive once the cleanup has been completed. However, fish consumption advisories likely will not be lifted completely due to larger watershed issues (such as mercury) and because concentrations of PCBs upstream of Portland Harbor are higher than the acceptable range based on conservative risk estimates, and sediments naturally move downstream. Over time, it is expected that source control actions on the part of DEQ in Portland Harbor and watershed-wide (including upstream areas) will reduce the need for stringent fish consumption advisories. We are uncertain how other actions in the river may over time contribute to reducing fish advisories further in the future.

Contrary to some of the commenters' view, EPA has been very transparent about the fish advisories and what benefit the cleanup would have and what was beyond the control of the CERCLA cleanup. The feasibility study report (USEPA 2016b) and proposed plan (USEPA 2016c) communicated what background levels existed and that watershed issues likely would lead to some fish advisory staying in place even after the remedy's cleanup goals were achieved.

2.3.4 Don't Select PRGs that Are Unattainable

Comment Summary

Many commenters stated that the PRGs presented in the feasibility study and proposed plan for the Portland Harbor Site were unattainable due to background concentrations. It was stated that many of the COCs identified for the Portland Harbor Site are ubiquitous in the environment and associated with a broad range of urban and agricultural sources and the PRGs are set below background. In particular, many commenters stated that the proposed PRG for PCBs in sediments of 9 micrograms per kilogram (µg/kg) was below the "equilibrium" concentration of 20 µg/kg as determined by the Lower Willamette Group. In addition, sediment PRG for DDx should be no lower than 5 µg/kg, and an equilibrium-based PRG for dioxin/furan should be developed during remedial design. It was also noted that the proposed PCB fish tissue goal of 0.25 µg/kg PCBs is lower than the 23 µg/kg PCB concentration EPA predicts based on its background concentration of 9 µg/kg.

One commenter stated that consideration of background is important because PRGs need to be attainable, and some of the risk-based PRG concentrations are less than the naturally occurring or anthropogenic background concentrations, meaning that PRGs may not be attained. If remediation goals are not reached, the cleanup and associated monitoring could continue in perpetuity. The commenter noted that it is common at cleanup Sites to require parties to achieve background concentrations as the remedial goal when there are known upstream sources. However, in the case of Portland Harbor, EPA has not used upstream background concentrations to set achievable remediation goals for surface water or tissue and has not used background concentrations that appropriately characterize chemicals coming into the Site for sediment PRGs. Comments say that EPA's remedy must use a realistic and appropriate set of cleanup levels that consider background, site equilibrium, and risk management. In establishing

unattainable PRGs, the proposed plan is setting unrealistic expectations for the public and discouraging the willing performance of cleanup activities.

One commenter advised EPA to not select risk-based PRGs below equilibrium values. In the dispute decision by Rick Albright, he stated that "there are sources of contamination outside of the Site – both upriver and within the downtown reach – that may affect the ability of the cleanup efforts within the Site to equilibrate to the selected cleanup level regardless of whether the cleanup level is based on risk, regulatory standard or background." The commenter advised EPA to not select risk-based PRGs below equilibrium values and stated that "EPA's failure to base its cleanup number on equilibrium are inconsistent with the reasoning of its own former director and an array of real world data and undermine the presumption that EPA's proposed cleanup goal for PCBs is realistically achievable."

One commenter (USACE) stated that chemical sediment data from 17 dredging projects within the Lower Willamette River indicates that EPA's PRGs are unattainable for most, if not all, projects within the Lower Willamette River outside sediment management areas (SMAs). Specific PRGs that are excessively low include arsenic, mercury, Dieldrin, hexachlorobenzene, carcinogenic PAHs (cPAHs), DDx, PCBs, and all dioxin/furan congeners. Figures 1.2-6a/b to 1.2-18a/b in the feasibility study report show that chemical concentrations exceed the proposed PRGs throughout the non-cleanup portions of the Harbor and thus demonstrate that EPA's PRGs are unattainable.

EPA Response

Consistent with EPA guidance and policy, background concentrations may be used to develop cleanup levels when risk-based PRG concentrations are less than naturally occurring or anthropogenic background. The derivation of background concentrations in sediment for the Site is described in Section 7 of the remedial investigation report (USEPA 2016a). Background concentrations for dioxin/furan congeners were not calculated in the remedial investigation report but were for the feasibility study report (USEPA 2016b) and are provided in Section 2 of Appendix B of that document.

Background sediment concentrations were based on sediment data collected upstream of the Site between RM 15.3 to 28.4. This area, which extends from the upstream end of Ross Island (just upstream of the downtown Portland area) to approximately 2.5 miles above Willamette Falls, was chosen because it is considered broadly representative of the upstream sediment loading to Portland Harbor and not generally impacted by sources within the Site. Background concentrations as represented by the deposited sediment concentrations within this reach remain the best predictor of achievable cleanup goals for the Site. Sediment data collected from the downtown reach were not utilized for the development of background levels due to sources in this reach being actively addressed by DEQ. Background sediment concentrations were used as PRGs for all COCs for which the risk-based PRG was less than background. Background concentrations were not established for surface water, groundwater or biota tissue due to the insufficient sample size associated with these media. Development of background levels for other medial may be considered during pre-remedial design characterization.

The Lower Willamette Group (LWG) developed equilibrium estimates based on upper confidence limits (UCLs) on a central tendency (median) of the empirical sediment lines of evidence (deposited surface sediment data, sediment traps, and suspended sediments). EPA selected a background-based PRG for PCBs based on a statistical evaluation of bedded sediments upriver of Portland Harbor. It should be noted that the sediment data for Portland Harbor are replete with a large signature of PCB concentrations at or less than the PRG of 9 µg/kg, which would not be possible if LWG's "equilibrium" theory were credible. It should be noted that EPA's determination of background was the subject of a

formal dispute by LWG and resulted in a March 24, 2015 dispute decision by EPA's Director of the Office of Environmental Cleanup. The dispute official concluded that EPA's methodology for establishing background concentrations for COCs at the Site was consistent with EPA guidance and followed the correct statistical procedures and thus, is appropriate for establishing background-based PRGs for the Site. EPA acknowledges that there are sources of contamination outside of the Site – both upriver and within the downtown reach – that may affect the ability of the cleanup efforts within the Site to equilibrate to the selected cleanup level regardless of whether the cleanup level is based on risk, regulatory standard or background, However, no new information has been provided in the public comments that would lead EPA to reach a different conclusion on the background methodology and the data that were taken.

EPA disagrees that achievement of background based PRGs and now final cleanup levels, is unattainable. As is noted above, many areas of the Site have PCB concentrations at or less than the PRG of 9 µg/kg. For more discussion on background PRGs and issues surrounding them, see Dispute Responses (Appendix A of this document) [AR Doc #500011627]. This demonstrates that active remediation through capping and dredging in conjunction with monitored natural recovery has the potential to achieve the background based PCB PRG of 9 µg/kg.

2.3.5 Address PRG Issues with Risk Management or Risk Assessment

Comment Summary

Commenters stated that EPA failed to incorporate risk management into the development of PRGs as evidenced by the large number of PRGs developed for the Site. It was noted that EPA has proposed that the remedial action be designed to achieve 107 different PRGs for 64 different chemicals. The commenters stated this number of PRGs is high in comparison to other major sediment sites such as the Lower Duwamish Waterway, Fox River, Lower Passaic River, and Grasse River sites. The commenters stated that EPA should exercise risk management to shorten the list.

Many commenters also stated that the PRG list is inconsistent with the conclusions of the human health and ecological assessments. It was specifically noted that PRGs should be developed only for COCs identified in the risk assessment. It was further stated that PRGs should only address potential risk for contaminants, media and pathways that were clearly found to pose unacceptable risks in the baseline risk assessments and should focus on the subset of unacceptable risks that are required for selecting an effective and protective remedy using all of the feasibility study criteria. Specifically, EPA should include in the feasibility study only those COCs and PRGs that meet the following requirements:

- For contaminant/exposure scenarios pairs that show unacceptable risk from in-river media
- Calculated with EPA approved baseline risk assessments methods
- Where there is scientifically valid information to calculate those PRGs
- That are technically practicable to achieve
- That reflect a reasonable risk management framework
- Can be attained through sediment remediation which would exclude surface water PRGs
- Can be applied to matrices that can be directly addressed through sediment remediation which would exclude fish tissue PRGs

One commenter stated that PRGs should be adjusted to reflect EPA's risk range based on its own risk management guidance. The commenter stated that EPA should set the target risk between 1×10^{-5} and 1×10^{-4}. Another commenter questioned how the PRGs were applied, stating that neither the recreational beach user nor the tribal fisher exposure scenario should be applied to establish a site-wide cPAH PRG because much of the Portland Harbor is designated for industrial use and public access is limited. The commenter also stated that EPA's site-wide application of a single PRG for both river bank soils and river sediments is inconsistent with its own guidance, which requires characterization of the exposure setting "with respect to the generally physical characteristics of the populations on and near the Site" and the baseline human health risk assessments, which evaluated recreational beach exposures only for specific areas and that a recreational beach exposure scenario is not likely for the majority of the Site given the industrial nature of the Site, which limits access. Finally, the commenter stated that EPA should use the approach utilized for the Lower Duwamish Waterway, which established different cPAH cleanup levels for different areas of the Site based on land use and exposure scenarios.

One commenter noted that EPA has established focused COCs that pose the greatest risk to human health and the environment and questioned why there are PRGs for the other 64 COCs that already have regional thresholds that are used in the PNW and have no RALs in the feasibility study and proposed plan.

EPA Response

As described in Section 2.2.2 of the feasibility study report (USEPA 2016b), PRGs were developed to address unacceptable human health and ecological risks identified in the baseline human health risk assessment (BHHRA) (Kennedy/Jenks Consultants [Kennedy/Jenks] 2013) and baseline environmental risk assessment (BERA) (Windward 2013) consistent with the NCP which states that "remediation goals shall establish acceptable exposure levels that are protective of human health and the environment"40 CFR §300.430(4)(e)(2)(i). The baseline risk assessments determined that contaminated sediments and surface water presented unacceptable risk to human health and the environment. Transition zone water was found to exceed MCLs for drinking water exposures and posed unacceptable risk to ecological receptors.

Regarding the number of COCs and PRGs, it should be noted that the Portland Harbor Site has numerous sources of contamination from a wide range of industries. Thus, while the use of focused COCs for the purpose of conducting evaluations in the feasibility study is considered appropriate because the remedial footprint of the focused COCs encompasses the majority of the COCs at the Site, the large number and diverse nature of sources and contamination presenting unacceptable risk at the Site necessitate the identification of a relatively large number of COCs in multiple media to be addressed by the response action. This comprehensive set of COCs and PRGs will ensure that EPA's remedy addresses all of the risk to human health and the environment at the Site, and are monitored for subsequent five year reviews, and addressed through source control actions.

For human health, risk-based sediment PRGs were calculated using reasonable maximum exposures for the most susceptible population evaluated in the BHHRA consistent with the NCP. For human health, PRGs were calculated based on direct contact with beach and in-river sediment (remedial action objective [RAO] 1) and consumption of fish and shellfish (RAO 2). MCLs, EPA tapwater screening levels, state water quality standards and national recommended water quality criteria were used to set PRGs for RAOs 3 and 4. For ecological risk, risk-based PRGs were developed from medium- and contaminant-

specific toxicity reference values protective of ecological receptors and used in the BERA. The specific methods used to develop PRGs are described in Appendix B of the feasibility study report.

EPA disagrees that the PRGs and now the final cleanup levels are inconsistent with the baseline human health and ecological risk assessments. Action is warranted based on unacceptable risk to human health and ecological receptors due to the presence of a variety of contaminants at the Site. Risk-based human health COCs were identified in beach and in-water sediment, fish tissue and surface water. Risk-based ecological COCs were identified in sediment, surface water, pore water, and river bank soil. As described in Appendix B of the feasibility study report, PRGs were then calculated for all contaminants that posed an excess lifetime cancer risk greater than 1×10^{-6} or a hazard quotient greater than 1 in the final Portland Harbor BHHRA assuming reasonable maximum exposure. For cancer effects, risk-based sediment PRGs were calculated as the concentration consistent with a specified target excess cancer risk of 1×10^{-6}. For non-cancer effects, the risk-based PRGs were the calculated concentration that would result in a specified target hazard quotient of 1. For both cancer and non-cancer effects, the sediment PRGs are calculated based on specified exposure pathways and receptors. Detailed equations that describe the PRG calculation methods are also presented in Appendix B.

Although EPA considered a range of PRGs that reflect EPA's risk range of 1×10^{-4} to 1×10^{-6} (see tables B3-4 and B3-5 of the feasibility study report), it should be noted that the State of Oregon regulations (OAR 340-122-0115[2] – Individual carcinogens – and OAR 340-122-0115[3] – cumulative risk from multiple carcinogens) require cleanups to achieve a 1×10^{-6} risk level for individual chemicals and a cumulative risk level of 1×10^{-5}. As a result, it is appropriate to select PRGs based on a 1×10^{-6} risk level and a hazard index of 1.

Regarding application of the site-use factor, see response to LWG Dispute Issue 1d (Appendix A of this document) which states in part "When potential exposure at more than a single area is considered likely, use of a site-use factor is no longer protective." Also, see response to LWG Dispute Issue 1j (Appendix A of this document).

EPA disagrees with the commenter that it is inappropriate to set a site-wide cleanup for the recreational beach user or the tribal fisher exposure scenario because much of the Site is designated for industrial use and public access is limited. Tribal fishers currently use the river, there are several beach areas accessible by people beyond designated public beaches, and land and waterway use is dynamic and may change in the future. Furthermore, some fish species are migratory, and in many cases, there is water access to the stream for recreational uses. As result it is appropriate to establish PRGs based on recreational and tribal fishing exposures throughout the Site.

2.3.6 Develop Technically Sound PRGs for cPAHs in Sediment

Comment Summary

It was noted that EPA has been unable to develop a technically sound cPAH sediment PRG for fish consumption due to the lack of a relationship between tissue and sediment. As a result, EPA assigned a shellfish consumption PRG to the navigation channel as a surrogate for fish consumption even though no shellfish harvesting can occur in the navigation channel. In addition, EPA inappropriately converted cPAH PRG to total PAH PRG based on irrelevant correlation calculation.

EPA Response

EPA agrees that it was not possible to develop a reliable cPAH sediment PRG for the fish consumption pathway due to the lack of a relationship between tissue and sediment. However, it was possible to

develop a sediment PRG for cPAHs based on the relationship between sediment and clam tissue. Contrary to the comment, the PRG was developed for cPAHs as benzo(a)pyrene equivalents (BaPEq). The relationship between cPAHs and total PAHs was used for the development of RALs. EPA also disagrees that the shellfish consumption pathway is not complete for the navigation channel. The commenter has not provided any information to support this statement, and there is no prohibition on collecting shellfish from within the navigation channel.

Regarding the development of different cPAH cleanup levels for different areas of the Site based on land use and exposure scenarios, EPA notes that the direct contact cPAH PRG is only applicable to nearshore areas. For other exposure pathways, such as shellfish consumption and exposure to the benthic community, exposure may occur throughout the Site, including nearshore areas and the navigation channel. Regarding consideration of bioavailability of PAHs in developing cleanup levels, EPA notes that studies of bioavailability were not conducted at the Portland Harbor Site and that, as stated in the response to comments on the benthic risk approach, site-specific toxicity testing may be where benthic risk cleanup levels are the only cleanup levels yet to be achieved.

2.3.7 Establish Fish Tissue Targets

Comment Summary

Some commenters stated that rather than establishing PRGs for other media in addition to sediment, EPA should follow the lead of the Lower Duwamish Waterway which established target levels for fish tissue and surface water to measure progress toward achieving RAOs and assessing the success of the selected remedy in conjunction with source control. In this EPA made it clear that the target levels were not cleanup levels and were to be used for informational purposes only. Other commenters stated that there should not be a fish tissue PRG or monitoring level for any chemical where there is no relationship between sediment and tissue.

EPA Response

PRGs were developed for fish and shellfish tissue because tissue concentrations represent a direct exposure point for human receptors and because tissue concentrations are needed to derive sediment PRGs for protection of human health due to fish consumption. However, based on public comments and upon reconsideration, EPA has determined that remedial levels for fish and shellfish tissue will not be enforceable cleanup levels. The selected remedy provides fish and shellfish tissue target concentrations to measure progress towards achieving RAOs 2 and 6, inform fish advisories, evaluate construction impacts, and update best management practices (BMPs) and institutional controls (ICs) as needed. Fish tissue levels are needed to evaluate the protectiveness of the remedial actions. Target tissue levels are not cleanup levels; rather they will be used for informational purposes to assess ongoing risks to people who may consume resident fish and shellfish. For protectiveness purposes, the fish tissue levels need to be achieved. If the fish tissue targets are not achieved, EPA expects to re-evaluate the remedy and determine what else may be needed. Tissue monitoring data will also inform the content and degree of any potential future fish advisories, and other ICs intended to minimize risk to recreational and subsistence fishers that may be identified in a ROD Amendment or explanation of significant differences.

2.3.8 Address Issues with the PRG for TPH Diesel for RAO 8

Comment Summary

Comments were received from three entities regarding the PRG for total petroleum hydrocarbon (TPH) diesel for RAO 8. That PRG is presented in Table 2.2-11 of the feasibility study report (USEPA 2016b) and is based on toxicity threshold concentration for the C10-C12 aliphatic hydrocarbon fraction and

because the C10–C12 fraction is a small subset of hydrocarbons present in the broader TPH-d fraction, a remedial cleanup level for TPH-d based solely on the toxicity of C10–C 12 aliphatic fraction it is not appropriate for groundwater or pore water.

One comment noted that the PRG for TPH-diesel in groundwater and pore water is neither supported in the administrative record nor technically defensible and should be eliminated. Another noted the analytical methods used to quantify aliphatic and aromatic hydrocarbons within the range of C5–C12 for VPH and C8–C34 for EPH have method detection limits above the C10 - C12 aliphatic hydrocarbon PRG of 2.6 micrograms per liter.

EPA Response

As described in Section 2.2.2.2 of the feasibility study report (USEPA 2016b), water toxicity reference values from Attachment 10, Table 2 in the BERA (Windward 2013) that are protective of ecological receptors were selected as risk-based PRGs for RAOs 7 and 8. This includes the PRGs for petroleum hydrocarbons.

In the BERA, EPA provided toxicity reference values for five of the chemical groups that are blended to form gasoline. Because these fractions were not quantified in Study Area samples, the average fraction of these components in gasoline was used to convert the total gasoline-range hydrocarbon concentration into gasoline fraction concentrations for comparison with the toxicity reference values. The BERA further notes that gasoline components were used as a surrogate for gasoline-range hydrocarbons. Each component is counted as an individual COPC in the COPC count determination. A summary of the PRGs for each fraction is summarized in the table below.

TPH Fraction	Toxicity reference values (micrograms per liter)
Gasoline-range hydrocarbons	No Value
Aliphatic hydrocarbons C4-C6	128
Aliphatic hydrocarbons C6-C8	54
Aliphatic hydrocarbons C8-C10	9.5
Aliphatic hydrocarbons C10-C12	2.6
Aromatic hydrocarbons C8-C10	212

Due to the detections of TPH diesel in groundwater and pore water at the Site and because the toxicity reference value for C10–C12 aliphatic hydrocarbons represents both the upper end of gasoline range hydrocarbons and the lower end of diesel range hydrocarbons, the toxicity reference value for C10–C12 aliphatic hydrocarbons was selected as the PRG.

The RAO 8 PRG is focused on reducing the migration of COCs in groundwater to sediment and surface water. As a result, the groundwater source control measures should be designed to prevent C10–C12 aliphatic hydrocarbons from discharging to the Willamette River at concentrations exceeding 2.6 micrograms per liter. Pre-design characterization activities should therefore include characterization of C10–C12 aliphatic hydrocarbons using the best available detection limits possible.

2.3.9 Explain the Bis(2-Ethylhexyl) Phthalate PRG

Comment Summary

One comment was received that questioned the RAO 6 BEHP PRG of 135 µg/kg. RAO 6 is focused on bioaccumulative chemicals and wildlife exposures. However, because there was not a good relationship between tissue and sediment for BEHP, the basis for the 135 µg/kg BEHP PRG is unclear.

EPA Response

The BERA (Windward 2013) concluded that BEHP was an ecologically significant contaminant of concern. All documentation supporting that is found in the BERA. No relationship was found between sediment and tissue concentrations for this COC. Therefore, as stated in Appendix B4.2.1, "For those contaminants where site-specific biota-sediment accumulation factors could not identify relationships between sediment and tissue concentrations, a nationwide theoretical biota sediment accumulation factor of 4.0 was used for hydrophobic organic chemicals (USACE 2003, Appendix G)."

2.3.10 Address Miscellaneous PRG Issues

Comment Summary

Multiple comments were received on a variety of PRG issues that are summarized and addressed in this category. Those issues are:

- **Development of PRGs only for sediment**. Other commenters stated that PRGs should be established only for sediments and not for tissue, soil, surface water, or groundwater because these media are being addressed by Oregon DEQ. There should be no surface water PRG because it is not possible to achieve them through sediment remediation, ARARs related to these PRGs should be waived by EPA in the ROD.

- **Manganese PRGs.** One commenter noted that the groundwater PRG for manganese should not be based on tap water standards (i.e., protection of surface water for direct human consumption) because 1) the surface water in the Willamette River already meets this identified PRG; 2) groundwater concentrations of manganese are not predictive of surface water concentrations because manganese becomes oxidized as it moves into the surface water and precipitates out of solution; and 3) human use of surface water from the Willamette River requires pre-treatment. The commenter requested that EPA eliminate any groundwater PRG for manganese because groundwater concentrations do not correspond to surface water concentrations or to concentrations in treated potable water. To the extent EPA employs any groundwater criteria for manganese, the approach should be based on ecological hardness-dependent criteria.

- **Benthic risk.** One commenter provided a table of proposed PRGs for the Portland Harbor Site based on equilibrium concentrations, risk-based concentrations or the comprehensive benthic risk areas.

EPA Response

EPA disagrees that only sediment PRGs are appropriate for this Site. The baseline risk assessments determined that contaminated sediments and surface water presented unacceptable risk to human health and the environment. Transition zone water was found to exceed maximum contaminant level (MCLs) for drinking water exposures and posed unacceptable risk to ecological receptors.

Regarding the number of COCs, it should be noted that the Portland Harbor Site has numerous sources of contamination from a wide range of industries. Thus, while the use of focused COCs for the purpose of conducting evaluations in the feasibility study is considered appropriate because the remedial footprint of the focused COCs encompasses the majority of the contaminants at the Site, the large number and diverse nature of sources and contamination presenting unacceptable risk at the Site necessitate the identification of a relatively large number of COCs in multiple media to be addressed by the response action. This comprehensive set of COCs and PRGs will ensure that EPA's remedy addresses all of the risk to human health and the environment at the Site, and is monitored for subsequent five-year reviews, and addressed through source control actions.

Consistent with Section 121(d) of CERCLA and the NCP, remedial cleanup levels are to be developed based on ARARs including MCLs promulgated under the Safe Drinking Water Act and water quality criteria established under Sections 303 or 304 of the Clean Water Act or state-promulgated water quality criteria unless site-specific circumstances require risk-based goals be developed. 42 U.S.C. § 9621(2). Also, see the response in Section 2.3.1 for more detail about the statutory and regulatory basis for application of ARARs as cleanup levels.

EPA disagrees that PRGs should not be developed to address inputs to the Site. As noted in the response to LWG Dispute Issue 1d, the upland sources are not separate and distinct from the contamination in the river. The feasibility study report (USEPA 2016b) covers the in-river portion of the Site and thus the RAOs and PRGs must be developed to protect the media and pathways for which contamination is present. Since the RAOs and PRGs developed for this Site are based on the baseline risk assessments and ARARs, those areas of the Site that already achieve PRGs would not require action since the PRGs are already attained. EPA provides the basis for the establishment of PRGs for each RAO in Section 2 and Appendix B of the 2016 feasibility study report. As a result, it is appropriate to develop sediment PRGs for groundwater and river banks.

Regarding manganese specifically, the groundwater PRG was calculated using the oral reference dose developed by EPA's Office of Research and Development and posted in its Integrated Risk Information System database. See response to LWG Dispute 1n (Appendix A of this document).

The human health and ecological risk assessments both determined that exposure to COCs in surface water poses unacceptable risk to human health and the environment. As a result, EPA developed PRGs for surface water. Surface water PRGs include both risk-based PRGs ecological risk assessment and ARAR based PRGs based on State of Oregon water quality standards and National Recommended Ambient Water Quality Criteria. Consistent with CERCLA and the NCP and State of Oregon water quality regulations, Lower Willamette River will have to meet risk-based criteria or the more stringent of the federal and state human health and aquatic life water quality criteria at or before the completion of the selected remedy or else have this requirement waived. As described in Appendix K of the feasibility study report, EPA expects that remediation of contaminated sediments at the Site will reduce surface water concentrations. If EPA determines in the future that it is technically impracticable to achieve these criteria, it may waive them in a future decision document.

EPA disagrees that the PRGs were applied at locations and spatial scales that are inconsistent with the exposure scenarios for which they were developed, and regardless of whether there was unacceptable risk for a given location. For example, PRGs for RAOs 1 and 2 are being applied on a SDU basis. As described in the feasibility study report, site-wide and smaller spatial scales were used to evaluate each alternative including attainment of the RAOs. To conduct the smaller spatial scale evaluation, the Site was subdivided based on sediment dynamics and hydrodynamics of the shorelines and Swan Island

Lagoon, current and future uses (such as the navigation channel), and the preference of many receptors for shoreline habitat. Subdivisions will allow for a more precise analysis of risk reduction for each alternative. Several spatial scales were evaluated: 1) benthic risk was evaluated on a population level as the area exceeding RAO 5 PRGs, 0.5 RM was used for RAO 1 consistent with the BHHRA (Kennedy/Jenks 2013), 1 RM was used for RAOs 2 and 6 for the dietary exposure of humans and ecological receptors that consume fish and shellfish, and Site-wide was used for RAO 2. The Site was also divided into 14 individual regions of the river that were designated as SDUs. The SDUs correspond approximately to the estimated 1-mile exposure area for which recreational fishing was evaluated in the BHHRA and to the home range of species such as smallmouth bass, hooded merganser, osprey, bald eagle and mink that were evaluated in the BERA (Windward 2013).

LWG provided a revised set of sediment PRGs based on comments on an earlier version of the feasibility study. The basis for many of the revised PRGs is based on revised background estimates, application of the comprehensive benthic risk approach and application of a site-use factor. EPA has considered these comments in the development of the PRGs presented in the feasibility study report and proposed plan (USEPA 2016c). In addition, EPA has explained previously the approach for developing PRGs protective of the benthic community, its approach to developing background estimates and the basis for not applying the site-use factors. Finally, the basis for EPA's PRGs is well documented in Appendix B of the feasibility study report. Additional responses to comments on PRGs may be found in the responses to LWG Dispute Issues 1d, 1i, 1j, 1m, 1n, and 1q and Union Pacific Railroad Dispute Issue 2 (Appendix A of this document).

2.3.11 BEHP Should Not Be a COC

Comment Summary

Three commenters suggest that BEHP should not be considered a COC. Two of the commenters note that risk associated with BEHP is not widespread, and ecological hazard quotients only slightly exceed the interim target. One commenter states there are numerous problems with concluding alternatives are not protective due to BEHP risks. They also state that BEHP exceedances only occur in a small area within Swan Island Lagoon and that EPA is inconsistent in assessing protectiveness because EPA did not consider risk reduction of ENR within Swan Island Lagoon. Another commenter states that BEHP is a ubiquitous chemical in urban runoff, a commonly identified cross-contaminant in sampling and analysis equipment, and not the focus of proposed cleanups in the harbor.

EPA Response

The BERA (Windward 2013) determined that BEHP posed a risk to wildlife through the consumption of prey. As noted in the comments, the PRG for BEHP was exceeded in many locations at the Site and by more than 10 in Swan Island Lagoon for Alternatives B and D. Thus, EPA concluded that Alternatives B and D are not protective of wildlife. EPA's feasibility study did not consider risk reduction from ENR within Swan Island Lagoon as a conservative approach given ENR's long-term effectiveness in achieving cleanup levels relies on MNR. However, EPA has calculated risk reduction with ENR within Swan Island Lagoon and has provided updated risk calculations in the ROD that take into account the uppermost effectiveness of ENR to bound possible benefits of its application. However, even taking ENR into account, Alternatives B and D are still not protective of wildlife. Finally, EPA disagrees that the evaluation of protectiveness is inconsistent. The tables presented in Appendix J identify areas of the Site where an HQ greater than 1 exists following construction. This information has been used to evaluate protectiveness on a river mile and sediment decision unit basis. Based on the results of the BERA, BEHP was identified as a COC for the Site. EPA acknowledges that BEHP is not a primary concern for ecological

receptors at the Site. BEHP is not a focused COC, and RALs were not developed for BEHP. However, the remedy is anticipated to address risk posed by BEHP by addressing the focused COCs will be confirmed by future monitoring.

EPA used validated data that were not qualified in any manner to indicate cross-contamination occurred. Further, the ubiquity of a COC is not reason to dismiss its risk. BEHP sources are known to exist in Portland Harbor including stormwater and certain upland facilities. Ongoing source control measures are expected to further reduce BEHP releases to the river via stormwater inputs.

2.4 Surface Water

2.4.1 Address Feasibility Study Errors Related to Surface Water

Comment Summary

Three comments were received regarding how surface water was addressed in the feasibility study report (USEPA 2016b). Most of these comments were presented as analysis errors in Appendix K of the report:

- "EPA used flow weights for averaging surface water data that are the opposite of the actual average annual river flow conditions. EPA assumed 240 days of the year were in a high flow condition, when the U.S. Geological Survey Portland river gauge data show that low flows (less than the long-term average of 33,000 cubic feet per second) occur about 250 days out of the year."
- "EPA used river mile 11 West and Navigation Channel data to calculate weighted average surface water concentrations (SWACs) for the Site and for concentrations entering the Site. Using these same data to represent both locations on the river results in inaccurate determinations for both locations."
- "Although perhaps a typographical error, EPA indicates it subtracted the concentration entering the Site from the average site concentration to obtain concentrations for the "Downtown Reach." As written, such a calculation would produce the contribution from the Site instead."
- "EPA assumes that post-construction surface water concentrations will decrease proportional to the percent reduction in sediment SWACs. This simplistic assumption ignores other contributions to surface water, most notably the upstream concentrations entering the Site. As a result, EPA estimates much greater percent reductions for the alternatives than is possible. For example, EPA calculates 92 percent reduction in Site surface water concentrations for Alternative G, but correctly accounting for upstream inputs would place this estimate at only about a 50 percent reduction."
- "EPA also ignores within-site upland sources such as National Pollutant Discharge Elimination System (NPDES)-permitted stormwater and NPDES-permitted process and cooling water discharges that are beyond the control of sediment remedies. For example, the annual loading summary provided in Table 6.1-11 of the EPA-approved remedial investigation shows that nearly 30 percent of the PCB load to the Site comes from stormwater."

One commenter expressed concerns that EPA has not sufficiently recognized contaminant loading from surface water sources (i.e., stormwater and upstream) or accounted for the reduction in surface water source concentrations.

EPA Response

The following address the specific concerns expressed by the commenters with the water quality analysis:

- The calculations assumed high flow conditions for 8 months out of the year, low flow conditions 3 months out of the year and stormwater inducted flow conditions 1 month out of the year. EPA acknowledges that high flow conditions (approximately 60,0000 cubic feet per second) do not occur 8 months out of the year. EPA assumed the low flow conditions sampled in September 2006 occur approximately 3 months out of the year (August – October), whereas the stormwater inducted flow conditions occur approximately 1 month out of the year (November). As noted in Section 3.1.4.2 of the remedial investigation report (USEPA 2016a), the Willamette River average daily mean discharge, as measured over the past 35 years is 33,000 cubic feet per second. Because the surface water data used to calculate reductions in surface concentrations did not include samples that represent this average flow conditions, the high flow data were considered more representative of the average flow condition than either the low flow condition or the stormwater induced flow condition and thus was assumed to occur 8 months of the year (December – July). This assumption is considered appropriate for a feasibility study level evaluation of reductions in surface water concentrations.

- As described in Section K3.3 of the feasibility study report (USEPA 2016b), the upstream contribution was estimated using the results from RM 11M and RM 11W. RM 11E was used in the estimate of site concentrations since it is affiliated with the RM 11E project area and is a known source of contamination.

- The feasibility study report is correct as written. As noted in Section K3.3 of the feasibility study report, the Site contribution was estimated by subtracting the averaged "downtown" surface water results from the average site surface water results. Downtown results were estimated based on an average of the RM 11W and RM 11M stations. Site results were estimated based on an average of the RM 11E, RM 6.3 NS, RM 6.3 NB, RM 3.9 NS, RM 3.9 NB, MC NS, MC NB, RM 2E, RM 2M, and RM 2W results.

- EPA did not include the upstream contaminant contribution in the evaluation of remedy performance because it is expected that source control actions, as well as actions taken within the broader Willamette River watershed to reduce contaminant loading, will further improve upstream water quality. Since the reductions are uncertain, monitoring will need to confirm actual water quality in the river.

- The evaluation conducted by EPA does not consider the contribution from stormwater because the expected decrease in stormwater contaminants is unknown. As a result, it is assumed that the reduction associated with stormwater is proportional to the reduction associated with each of the alternatives.

In the surface water analysis approach included in Appendix K of the feasibility study report (USEPA 2016b), EPA subtracted out the contribution from upriver sources, acknowledging other inputs to the Site. Since EPA further assumed in the feasibility study report that all upland sources to the river would be controlled, the only remaining input to the surface water is contaminated sediment and water from upstream of RM 15.9. EPA disagrees with assertions that stormwater, groundwater, and upstream inputs will not change since DEQ has been working with entities to control upland and upriver sources

(RM 11.8 to RM 16.6) to the Site throughout the remedial investigation/feasibility study process and will continue these efforts post-ROD. Because background is based on conditions upstream of RM 15.9, recontamination would only reach background levels. Other sources are expected to be adequately address as discussed in the Section 2.27.1 of this responsiveness summary.

EPA recognizes that the site conditions (including surface water runoff) have changed since the start of the project and anticipates they will continue to change as previously stated. EPA will consider new technically sound data during remedial design.

2.4.2 Compliance with State and Federal Standards

Comment Summary

A total of 37 comments were received that expressed concern about meeting water quality standards. Most (24) were form comments received by email that read:

- "The community expects the final remedy to comply with state environmental quality, especially the water quality criteria for the PTW contaminants. PCBs, dioxins and DDTs in water and fish must meet state water quality standards."

Ten other comments agreed with this statement, and many also cited the Clean Water Act. Those comments include:

- "In terms of the final remedy, I ask that it comply with state environmental quality, especially the water quality criteria for the principle threat waste contaminants. PCBs, dioxins and DDTs in water and fish must meet state water quality standards. As well, I ask that the final cleanup names a specific goal date for the lifting of the Fish Consumption Advisory in regards to PCBs within the Portland Harbor area."
- "ALL standards, including the drinking water and surface water standards should be met after the cleanup is complete."
- "We would hope that before the superfund cleanup commences that there will be much more stringent requirements in place. Goals should have zero tolerance for pollutants where ever possible. Monitoring the entire site should be in perpetuity and should contain no contingencies based on a best guess but concrete facts."
- "I think the clean water compliance act should be enforced."
- "I expect the final remedy to comply with state environmental quality, especially the water quality criteria for the PTW contaminants. PCBs, dioxins and DDTs in water and that fish must meet state water quality standards."
- "Meet threshold requirements for protectiveness including Clean Water Act standards."
- "Comply with State water quality and hazardous substance remedial action rules for risk."

EPA Response

EPA acknowledges the commenters' concerns about water quality and that the cleanup should achieve Clean Water Act criteria. Contaminants in surface water at the Site come from resuspension and/or dissolved phase flux from the sediment bed, river banks, groundwater, and stormwater and, to a lesser extent, from upstream. As described in Section 6.1 of the remedial investigation and stated in Section

1.2.3.3 of the feasibility study report (USEPA 2016b), concentrations of contaminants in surface water at the Site are generally higher than those entering the upstream limit of the Site (based on sampling at RM 16) under all flow conditions. The highest contaminant concentrations in surface water at the Site were found near known sources. EPA's proposed plan (USEPA 2016c) focuses on the cleanup of sediments and river banks to reach cleanup goals in several in-river media, including surface water and pore water, whereas separate source control actions under the authority of DEQ focus on reducing contaminants from groundwater and stormwater.

EPA's cleanup will comply with substantive requirements of the Clean Water Act. First, the final remedy has established surface water and groundwater cleanup levels for many contaminants based on risk-based remediation goals that are more stringent than Clean Water Act criteria, and for other contaminants based on Clean Water Act criteria and/or state promulgated, numeric water quality criteria, and the Safe Drinking Water Act. The cleanup levels for RAO 3 (surface water/human health) and RAO 4 (groundwater/human health) are based on the lower of the federal National Recommended Water Quality Criteria established under Section 304(a) of the Clean Water Act, Oregon water quality criteria, MCLs, and non-zero MCL goals, as presented in Table 2.1-4 of the feasibility study report and in Table 17 of the ROD.

The ecological risk-based cleanup levels were developed from toxicity reference values protective of ecological receptors and used in the BERA (Windward 2013). Toxicity reference values for water were selected as risk-based cleanup-levels for RAO 7 (surface water/ecological) and RAO 8 (groundwater/ecological). The cleanup levels for RAO 7 are based on the lower of the National Recommended Water Quality Criteria and Oregon water quality criteria only when risk-based values are not available or are greater than these criteria, as presented in Table 2.1-4 of the feasibility study report. EPA expects that remediation of contaminated sediments in conjunction with source control measures will reduce surface water contaminant concentrations to levels that meet state water quality standards. Additional source control efforts will be required within the Willamette River watershed to further reduce the levels of these contaminants. Monitoring of surface water will be conducted to confirm reductions in surface water contaminant concentrations and monitor compliance with state water quality standards.

Additionally, the remedy requires that implementation of cleanup actions must comply with the substantive requirements of the Clean Water Act. Section 401 of the Clean Water Act and Oregon water quality regulations as ARARs require cleanup actions that may result in the discharge of pollutants to surface water be implemented in a manner that reasonably assures that the activity will not violate applicable state water quality standards by the imposition of effluent limitations, other limitations, and monitoring requirements. During cleanup, short-term exceedances of some state water quality standards are possible, particularly when sediments are dredged. Under Oregon state law, Oregon Administrative Rules 340-041-004, short-term degradation of surface water is allowable if the benefits of the lowered water quality outweigh the short-term environmental impacts. This evaluation will be conducted during remedial design. Conditions on the dredging and capping will be required based on a water quality monitoring plan that outlines how the cleanup activities will take place to minimize sediment resuspension that would affect water quality, and if necessary, ramp up best management practices like dredging controls where sampling indicates unacceptable levels of migration of dissolved or particulate bound contaminants. Section 2.17 of this responsiveness summary provides more detail on monitoring to be conducted during and after cleanup.

2.4.3 Address Issues with Assignment of MCLs

Comment Summary

Comments were received asserting that EPA incorrectly establishes Safe Drinking Water MCLs as ARARs for the Site and stating that Oregon water quality standard regulations designate the Lower Willamette River as a potential public and private water supply only following adequate pretreatment citing Oregon's designated use regulation for the Willamette Basin, Oregon Administrative Rules 340-041-0340, specifically Table 340A. Commenters also extended their argument that MCLs should not be ARARs for groundwater cleanup levels (1,1-DCE, 2,4-D, perchlorate, and 2,4,5-TP) and regional screening levels (manganese).

LWG expressed that it is not appropriate to assign MCLs to surface water and/or groundwater because they are "likely not achievable," not required for protectiveness, and not relevant to "reasonable and likely uses of groundwater." LWG suggested that if MCLs are retained as surface water or groundwater PRGs, they should be "applied at the theoretical point of distribution after treatment, consistent with Oregon and federal law," citing Oregon's designated uses for the Willamette Basin, Oregon Administrative Rules 340-041-0340, Table 340A; and Safe Drinking Water Act regulations, 40 Code of Federal Regulations Part 141, Section 141.23(a).

EPA Response

MCLs are appropriately identified as ARARs for the Portland Harbor Site as cleanup levels for surface water and groundwater. CERCLA Section 121(d) requires: (1) that any remedial action selected shall attain a degree of cleanup of hazardous substances, pollutants, and contaminants released into the environment and control of further releases at a minimum which assures the protection of human health and the environment; and (2) for any hazardous substance that will remain on site, such remedial action shall require a level or standard of control which at least attains Maximum Contaminant Level Goals established under the Safe Drinking Water Act, and water quality criteria established under Section 304 or 303 of the Clean Water Act. 42 U.S.C. § 9621(d)(1) and (2)(A). MCLs are relevant and appropriate under the circumstances of the release at Portland Harbor because the designated beneficial uses of the lower Willamette River include public and private drinking water supply (Oregon Administrative Rules 340-041-0340, Table 340A). Likewise, all ground water of the state, including the ground water adjacent to and under the lower Willamette River, are to be protected for the beneficial use of domestic drinking water supply. (Oregon Administrative Rules 340-040-0020(3)), which is as stringent or more stringent than the "EPA Guidelines for Ground-Water Classification" (December, 1986) (See 55 Federal Register 8732, March 9, 1990). Releases of hazardous substances which exceed applicable promulgated water quality standards and relevant and appropriate Safe Drinking Water Act standards for groundwater and surface water cleanup have occurred to groundwater that is discharging to or under the river within the Site or has the potential to discharge to the river. For further detail about the statutory and regulatory requirements for applying MCLs under CERCLA and at the Portland Harbor Site, see the response in Section 2.3.1. and LWG Dispute comment 1m response (Appendix A of this document).

EPA disagrees with the comment that "MCLs should not be considered ARARs at the Portland Harbor Site because the Oregon statute designates the Lower Willamette River as a potential public and private water supply only following adequate pretreatment" citing to a note in Table 340A.

However, there is other regulatory language the commenters ignored that does not support their position. Oregon Administrative Rules 340-041-0340(1) states: "Water quality in the Willamette Basin . . . must be managed to protect the designated beneficial uses shown in Table 340A (August 2005)." Table

340A lists both public and private domestic water supply as beneficial uses with a notation that states in full: "With adequate pretreatment and natural quality that meets drinking water standards." On its face, the notation does not void the state's regulatory mandate to manage water quality to protect the drinking supply use, but rather seems to be indicating what conditions should exist or occur for a consumer to take advantage of the designated use. Oregon Administrative Rules 340-041-340(1) supports why it is appropriate for the Portland Harbor remedy to protect the beneficial use of drinking water supply by requiring both surface water and groundwater discharging to the river to meet MCLs. Additionally, most PRGs for surface water and groundwater are based on more stringent water quality standards, not MCLs.

EPA also disagrees with the commenters that MCLs are not achievable through the planned remedial actions. No data or studies have been conducted that support that assertion. Although in-river sediment remedies and upland source control measures may not achieve MCLs immediately, compliance with MCLs will be monitored during implementation of the remedy. If monitoring indicates MCLs may not be achieved, further evaluation will be required to determine what additional source control measures or other actions may be necessary or whether meeting MCLs is not technically practicable. If it is demonstrated that achieving MCLs is not technically practicable, a waiver of that ARAR may be necessary.

Lastly, commenters argue that if MCLs are applied, they should only be applied at the theoretical point of distribution consistent with the Safe Drinking Water Act regulations and are not required for protectiveness. The Safe Drinking Water Act regulates public water supplies and sets primary drinking water standards for such systems. CERCLA, however, is a remedial statute and explicitly requires that any remedial action shall require a level or standard of control which at least attains Maximum Contaminant Level Goals established under the Safe Drinking Water Act, and water quality criteria established under Section 304 or 303 of the Clean Water Act. 42 U.S.C. Section 9621(d)(A) when relevant and appropriate to the releases at the Site. The Safe Drinking Water Act MCLs are not applicable to the circumstances of the releases and risks being addressed in this remedy decision, but they are relevant and appropriate given the beneficial uses of both groundwater and the river and releases of hazardous substances to both of those media within the Site.

2.5 Principal Threat Waste

2.5.1 EPA's Identification of PTW that Cannot be Reliably Contained is Flawed

Comment Summary

One comment was received that stated that the presence of highly toxic or mobile material does not by itself constitute PTW and that EPA errs by designating "highly toxic PTW" in a vacuum, solely in comparison to the risk level of detected concentrations of contaminant in sediments. To comply with guidance, EPA is required to also determine that such concentration is present in material that "cannot be reliably contained," or that the "toxicity and mobility ... combine" to pose a high risk, or that the toxicity is high when taking into account "the potential mobility of the wastes." EPA states, "'reliably contained' was not used in identifying PTW in the first instance, but rather it was used to determine what concentrations of already-identified PTW could be reliably contained." This contradicts EPA's guidance, which discusses the "reliably contained" criterion as part of PTW identification and not as a modifier once PTW has been identified. Further, EPA admits that all COCs at concentrations present at the Site, with just two exceptions-chlorobenzene and naphthalene-can be reliably contained. Therefore, none of the areas where these two contaminants are absent should be designated as PTW. Only the

areas that EPA designates as "not reliably contained" have the potential to actually be defined as PTW, yet such an evaluation has not been performed. Without this step, no area can be designated as PTW.

EPA Response

Please see EPA's responses to Legacy Site Services (LSS) Dispute Issue 17 and LWG Dispute Issue 2c (Appendix A of this document).

2.5.2 Provide Justification for PTW for Total PAHs

Comment Summary

One commenter stated that there appears to be an error on Table 13 of the proposed plan where it lists a PTW RAL for Total PAHs of 870,000 µg/kg. PTW applies to cPAHs not total PAHs. The "Highly Toxic PTW Threshold" for cPAHs is identified as 106,000 µg/kg BaP eq on Table 6 of the proposed plan, consistent with Table 3.2-1 and Figure 3.2-3 of the 2016 feasibility study report. The cPAH PTW criteria should be listed. If this is not an error, please provide justification for the assignment of a PTW value of 870,000 µg/kg for Total PAHs.

EPA Response

The value of 870,000 µg/kg in Table 13 of the proposed plan (USEPA 2016c) is a cPAH concentration converted to total PAHs using an empirically derived relationship between the two. Thus, the 10^{-3} risk level was calculated for cPAHs and then transformed to total PAHs.

2.5.3 Reliance on Remedial Investigation Mechanistic Food Web Model Is Inappropriate

Comment Summary

One comment was received about the mechanistic food web model:

- "As a starting point, EPA has inappropriately relied on the remedial investigation Mechanistic Model (Windward, 2015) to define a PTW sediment concentration threshold for PCBs (and several other contaminants). EPA guidance defines PTW as a "source material" that "acts as a source for direct exposure." (EPA 1991). The remedial investigation Mechanistic Model, in contrast, is used in the evaluation of indirect human exposure through the fish consumption exposure pathway. It is erroneous to use the remedial investigation Mechanistic Model to designate PTW levels.

  Even if it were appropriate to use the remedial investigation Mechanistic Model for purposes of establishing PTW levels, EPA has misapplied it here. EPA has chosen to apply the PTW concentration thresholds it has developed for the fish consumption exposure pathway on a point-by-point basis to identify PTW "source materials." This application is contrary to the assumed exposure area in the remedial investigation mechanistic report and is therefore inappropriate and incorrect. Most fish have wide home ranges and, consequently, their exposure will not be restricted to locations within the study area where sediment concentrations exceed the PTW threshold. Finally, the PTW threshold concentration is calculated under the inappropriate assumption that a subsistence fisher will, throughout his/her lifetime, exclusively consume fish from Portland Harbor that have only been exposed to sediments containing the PTW threshold concentration. Clearly, this last assumption adds yet another layer of implausible conservatism to EPA's misguided approach to defining a PTW threshold in sediments."

EPA Response

The mechanistic food web model was appropriately developed, parametrized, calibrated and applied to develop risk-based PRGs associated with RAOs 2 and 6 and, by extrapolation, PTW thresholds. EPA responses to comments on the Mechanistic Food Web Model are provided in Section 2.11 of this responsiveness summary. The definition of source material in EPA guidance states that source material is defined as "material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, to surface water, to air or acts as a source for direct exposure." Thus, the definition of source material is not limited to material that acts as a source for direct exposure. Although biota tissue is not specifically mentioned, the concept of contaminated sediments acting as a source of contamination to biota tissue is consistent with the guidance.

Regarding the scale over which PTW is applied, the highly toxic PTW threshold is based on the sediment concentration that equates to a 1×10^{-3} risk level without consideration of exposure scale. There is nothing in EPA guidance that requires consideration of exposure scale in the development of PTW thresholds. It should be noted that the risk assessment determined that many areas of the Site exceed the 1×10^{-3} risk threshold for PCBs. For example, Table 5-74 of the BHHRA (Kennedy/Jenks 2013) shows that the site-wide risk associated with PCBs and the subsistence fish consumption exposure pathway is 9×10^{-3} which is well above the PTW risk threshold. As a result, it is appropriate to establish a highly toxic PTW threshold for PCBs based on 1×10^{-3} risk and apply that threshold across the Site. The risk assessment assumptions developed for the subsistence fisher are appropriate under a reasonable maximum exposure scenario.

See also response to LSS Dispute Issue 2 and LWG Dispute Issue 2c (Appendix A of this document) for more discussion of PTW identification at the Site and Section 2.11.1 of this document for more information on the mechanistic food web model.

2.5.4 Address Miscellaneous PTW comments

Comment Summary

Several PTW miscellaneous comments were received. They are:

- PTW determination is unnecessary and inconsistent with guidance, the NCP, and practice which results in EPA incorrectly labeling as PTW large areas of sediment with relatively low concentrations and/or low toxicity of COC, or sediments that do not act as a source of direct exposure, and can be reliably contained.
- The assessment or identification of PTW and non-aqueous phase liquid (NAPL) (adjacent to Arkema) is inaccurate.
- A biased approach was used for assignment of remedial technologies to sediment containing PTW and NAPL.

EPA Response

Please see LSS Dispute Issues 2 and 17, and LWG Dispute Issue 2c (Appendix A of this document).

2.6 Remedial Action Levels

2.6.1 Address Concerns with Establishment and Application of RALs

Comment Summary

Many commenters believe that EPA's proposed plan arbitrarily establishes different RALs to different SDUs. It was noted that assigning different RALs could result in recontamination of downstream areas if higher RALs were utilized upstream. In addition, it was noted that the feasibility study report and proposed plan did not provide sufficient explanation of the basis for this decision. It was also noted that during remedial design, additional sampling will be conducted that may identify additional risk associated with dioxin/furan, yet the cleanup levels will remain the same.

Other commenters stated that EPA's selection of Alternative F for SDU 7W is arbitrary and capricious because it is based on a scientifically inappropriate conceptual site model (CSM), inaccurate baseline sediment concentrations and assumed risk, incorrect risk drivers, inconsistent post-construction risks among SDUs, and a faulty estimation of risk reduction to justify large dredge volumes.

Some commenters questioned the application of RALs in certain parts of the Site. For example, PAH RALs should not be applied in the navigation channel (RAL comment). The RALs must be applied only in exposure areas where the baseline risk assessments found unacceptable risks from the RAL chemicals. As discussed in LWG comments, EPA's preferred alternative requires significant amounts of dredging at locations where exposure to the RAL chemicals driving the cleanup either does not occur, where PRGs for those chemicals are already met, or where the baseline risk assessments did not find unacceptable risk for a given contaminant/exposure pathway. The most dramatic example of this is the approximately 25 acres of dredging EPA plans in the navigation channel based upon preliminary remediation goals for polycyclic aromatic hydrocarbons (PAHs) developed for shellfish consumption, an exposure scenario that cannot occur in the navigation channel. No one goes clamming in 50 feet of water in the middle of the river.

Another commenter questioned the use of a 75 µg/kg RAL for SDU RM 7W because the focused COCs for SDU RM 7W were DDx/PeCDF/TCDD, not PCBs (proposed plan Table 16 (USEPA 2016c)). They noted that of the 8 SDUs with PCB listed as a Focused COC, 7 SDUs have a PCB RAL of 200 µg/kg and that remediating the sediment in this area to the 75 µg/kg PCB RAL would have a minimal effect on the concentration of DDx, PeCDF or TCDD in SDU RM 7W and would not be cost effective in reducing the site-wide PCB SWAC.

It was also noted that EPA's remedy selection improperly relies on SWAC values that were calculated using data that are more than a decade old. Consequently, the RALs established by EPA based on those SWACs reflect an outdated "snapshot" of Site conditions as they were 10 to 15 years ago, rather than current conditions.

One commenter stated that EPA should apply Alternative D or E RALs for non-focus COCs in SDU 7W or extend SDU 6W to include the entire Siltronic shoreline. The use of Alternative D or E RALS more appropriate for non-focus COCs would reduce the projected active remedy area that is unrelated to the focus COCs. Alternatively, applying Alternative F RALs for the focus COCs would result in post-construction concentration estimates that are consistent with other SDUs. Either of these approaches would avoid the unwarranted designation of much of the Siltronic shoreline for river bank remedy.

It was further noted that DDx risks at RM 7W are similar for Alternatives B through E and equate to 10^{-7} risk for Alternative F. The use of this overly aggressive RAL for DDx results in a more stringent risk

standard for SDU RM 7W than the rest of the Site, is not necessary, nor more protective when compared to chemicals such as PCBs and is thereby arbitrary and capricious.

One commenter stated that EPA's determination that sediments near RM 10.7 exceed RALs and must be remediated as PTW is not based on available data and is therefore arbitrary and capricious. Another commenter requested an explanation for why there are PRGs for the other 64 COCs that already have regional thresholds but have no RALs in the alternatives. Finally, one commenter requested a Site remedy that focuses on active remediation of the highest contaminant concentrations and relies on the following RALs:

- PCB RAL of 1,000 ppb
- DDE RAL of 1,000 ppb
- cPAH (as BaPEq) RAL of 20,000 ppb

EPA Response

EPA's proposed plan (USEPA 2016c) explained the basis for the different RALs in Alternative I; however, after reviewing public comments, EPA has selected Alternative F with modifications as the final remedy. EPA agreed that applying different RALs, particularly, higher RALs upstream of lower RALs could be problematic for achieving the ultimate cleanup goals. The selected remedy applies the same remedial action levels (F RALs) throughout the Site, with the exception of the navigation channel where the remedy will target PTW and sediment contamination exceeding the Alternative B RALs because of the differences in water depth, sediment transport potential and exposure potential. EPA's final selected remedy addresses the majority of the comments concerned about the application of different RALs for the same COC, including claims that the selection of different RALs in different nearshore areas is arbitrary and capricious.

Regarding application of PAH RALs in the Navigation Channel, the remediation of PAH contamination within the navigation channel is based on risks to the benthic community and the human health shellfish exposure scenario. Although the commenter states that human consumption of shellfish is an exposure scenario that cannot occur in the navigation channel because no one goes clamming in 50 feet of water in the middle of the river, there is no information to support this claim. It should be noted that RALs are not the final cleanup levels. The ROD established final cleanup levels that will be attained through a combination of active remediation (such as, capping and dredging) and monitored natural recovery. Cleanup levels must be met throughout the Site, including the navigation channel.

Additional information regarding the application of PAH RALs in the Navigation Chanel may be found in EPA's response to LWG Dispute Issue 1d (Appendix A of this document) of this responsiveness summary.

It was noted that EPA established PRGs for 64 COCs but developed RALs for only 6 focused COCs. As described in Section 3.4.1.1 of the feasibility study report (USEPA 2016b), focused COCs are those that the distribution encompasses the majority of the spatial extent of contaminants posing the majority of the risks as identified in the baseline risk assessments. RALs were developed for each of the focused COCs and were used in the feasibility study only for the development of SMAs. SMAs establish the remedial footprint to be addressed through capping and dredging during implementation of the remedy.

Regarding the proposal to establish RALs for PCBs at 1000 µg/kg, DDE at 1000 µg/kg and cPAHs (as BaPEq) at 20,000 µg/kg, EPA finds that these RALs would result in Site-wide SWACs well above the PRGs established for the Site. For example, a PCB RAL of 1000 µg/kg would result in a site-wide SWAC of approximately 55 µg/kg. Based on existing information and the lines of evidence used for identifying MNR potential (see feasibility study report Appendix D8, EPA concludes that use of the RALs recommended by the commenter likely would not achieve final cleanup levels within a reasonable timeframe and potentially would not support MNR recovery. Regarding the remediation of contaminated sediments in the vicinity of RM 10.7, see the response to UPPR Dispute 6 (Appendix A of this document).

2.7 Remedial Action Objectives

2.7.1 Implement Changes to Remedial Action Objectives

Comment Summary

Comments pertaining to RAOs were submitted by several parties, including the PCI Group, EVRAZ Inc., Cascade General, and Portland General Electric. One commenter stated that RAOs should not be required for exposure media, pathways, and receptors for which the risk assessments conclude there is no unacceptable risk. EVRAZ Inc. comments also stated that the overall RAO language be changed to focus on reducing risk instead of reducing COC concentrations. Portland General stated that RAO 3 should be eliminated because current water sampling conducted by DEQ shows the risk to direct human health surface water exposure to be minimal. Another commenter (EVRAZ Inc.) stated that RAOs 3 and 7 should be removed because the remedial action cannot control the quality of surface water flowing into the Site, and RAOs should reflect objectives that are achievable. EVRAZ Inc. also proposed that RAOs 4 and 8 be removed because these RAOs pertain to reducing groundwater COC concentrations to minimize recontamination of sediment and surface water, and are not about exposure to the groundwater itself. Cascade General commented that EPA's proposed plan should be revised to provide a thorough analysis of the anticipated long-term effects of controlling the city 's CSO discharges (e.g., Big Pipe Project) on meeting the site-wide RAOs, and, if supported by this analysis, implement less aggressive remedial measures such as applying monitored natural recovery to a wider area. Comments pertaining to RAO 9 are included in Section 2.26 of this responsiveness summary.

EPA Response

The cleanup strategy for the Site was developed to address all contaminated media and complete exposure pathways that pose unacceptable risk within the river, including sediment, biota, surface water, groundwater, and river banks. The nine RAOs were developed to address the human health and ecological risks posed by COCs at the Site, and reduce the potential for recontamination. The remedial approach is to address the contaminated sediment within the Site, reducing concentrations, exposure to and the bioavailability of COCs in all affected media (sediment, biota, surface water, groundwater, and river banks). To achieve the risk reduction in all media, it is imperative that all nine RAOs are addressed to reduce the overall risk to people and ecological receptors.

Reducing risks from direct contact with COCs in surface water, as described in RAOs 3 and 7, is an important component of the overall remedy. EPA recognizes that upstream surface water quality is a factor in meeting surface water cleanup levels, but due to sediment contamination, surface water concentrations within the Site are generally higher under all flow conditions than those entering the upstream limit of the Site. Additional surface water data will be obtained following remedy implementation to compare the COC surface water concentrations within the Site boundaries to upstream and downstream values. If the data indicate that the inflow of upgradient surface water is

prohibiting attainment of surface water quality criteria, EPA will make the determination as to whether further action (like additional upland or upriver source control) is warranted. Controlling the migration of COCs in groundwater that may impact sediment and surface water quality, as described in RAOs 4 and 8, is also an important component of the overall remedy. Elevated COCs in groundwater can negatively impact transition zone water quality in sediment and increase risks to benthic organisms, fish, and aquatic plants. Direct contact with groundwater discharging via seeps is also a potential exposure pathway. RAOs 4 and 8 are focused on containing and reducing migration of COCs from groundwater to surface water and biologically active areas of sediment. Should groundwater not be addressed adequately under DEQ's actions, EPA may, at a future time, determine if action is warranted under CERCLA to further address groundwater contamination. Removal of RAOs 4 and 8 is not warranted.

The RAOs and the proposed remedy take into account ongoing source control efforts, including the control of CSO discharges, stormwater discharges, groundwater discharges, and erosion of river bank soils. The effectiveness of monitored natural recovery assumes that source control will be implemented and discharges from CSOs will not continue to impact the waterway. The elimination of these discharges in conjunction with active sediment remediation through dredging and capping will facilitate natural recovery processes and allow the remedy to meet the RAOs in a reasonable timeframe. Comments pertaining to RAO 9 are addressed in Section 2.26 of this responsiveness summary.

2.7.2 Incorporate Newer Data in Surface Weighted Average Calculations

Comment Summary

Six comments were received regarding the data used for calculating surface-area weighted concentration (SWAC) values. Commenters recommended that new SWACs be developed based on more recent data.

Commenters said that the SWAC calculations did not take into account the most recent data available and thus misrepresent the current conditions. It was stated that more recent PCB samples have been taken, and including the data would reduce the initial SWAC for PCBs. They also referred to a 2013 LWG evaluation of small mouth bass PCB tissue measurements made in 2002, 2007, and 2012 which indicate declines in tissue concentrations across almost all areas of the Site. Further, it was stated that 2014 sedimentation bathymetry data and 2014 site-wide sediment PCB data support a downward trend in contaminant concentration in surface sediments due to the effects of natural recovery at the Site. LWG also commented that because only a limited number of dioxin/furan samples are available and detected, the SWAC calculation across the Site for each congener is flawed.

EPA Response

EPA is anticipating that new data will be taken into account during remedial design and implementation. Please see Section 2.10.2 of this responsiveness summary and EPA's response to LWG Dispute Issue 1d for additional details regarding the data used, and the rationale for SWAC calculations (Appendix A of this document).

2.7.3 Address SWAC Reductions and Natural Recovery

Comment Summary

Three comments pertaining to SWAC reductions and natural recovery were received, as summarized below:

- The preferred alternative would take nearly twice as long to complete, but would only reduce the site-wide PCB SWAC by an additional 17 percent, to 40 µg/kg. This concentration is actually in the range of site-wide sediment concentrations measured in 2014 (Kleinfelder 2015), suggesting that the estimated benefit from the preferred alternative has already been at least partly achieved through natural recovery.
- The post-remediation SWAC reductions for DDx in the RM 7W was more than 60 percent. The SWAC reductions for PeCDF and TCDD were nearly an order of magnitude. LSS believes that this is too conservative since it does not take into account natural recovery. Remediation with natural recovery is protective of human health and the environment.
- EPA's overall PCB SWAC estimate in the Swan Island sediment decision unit for Alternative I is 48 µg/kg. However, this SWAC value reflects only the effect of remediation at dredged and dredge/cap areas of Alternative I and does not account for the effect of ENR. It is unclear why EPA has excluded the effect of ENR because EPA accounted for the effect of ENR on SWACs in the 2015 draft feasibility study report (USEPA 2015).

EPA Response

EPA agrees with the importance of considering new data during decision making and that decisions should have built in flexibility to accommodate an updated understanding of site conditions. However, it is important to have a representative data set that establishes "baseline conditions" prior to initiating a response action. A decision-making process cannot undergo constant modification when data are collected at various times and locations throughout the Site. Therefore, at this time, EPA does not plan on using the 2015 Kleinfelder Report to revise the RALs used to develop remedial alternatives in the feasibility study report. Further, data presented in the 2015 report do not on their face appear comparable to previously collected remedial investigation data (10cm surface samples vs the 30cm samples collected in the remedial investigation), making the conclusions therein regarding trends questionable. However, some conclusions provided in the August 7, 2015 memo to Jim Woolford and Cami Grandinetti are reasonable and consistent with the Agency's position, specifically that natural recovery is occurring in the Willamette and is anticipated to continue and that the food web model is a useful line of evidence for representing sediment and food web contaminant relationships. EPA expects remedial footprints to be refined based on data collected during remedial design. For example, if sediment concentrations have declined through natural recovery, pre-design sampling should result in a smaller remedial footprint (ROD Section 10.1.1.9).

EPA concurs that natural recovery is occurring within Portland Harbor and that it should be utilized in the sediment remedies, as evidenced by the fact that MNR represents the response action assigned to between 64 and 90 percent of the total area of the Site for all alternatives carried through the detailed analysis in the June 2016 feasibility study. However, the rate of natural recovery is expected to vary by location. Pre-design sampling will be used to ensure that the natural recovery is factored into the design and implementation of the sediment remedy and post construction monitoring will be used to evaluate natural recovery following remedy implementation.

For EPA's additional responses to the comments summarized above, please see EPA responses LWG Dispute Issue 2b, LSS Dispute Issue 5, and LSS Dispute Issue 8 (Appendix A of this document).

2.7.4 Revisit Post-Construction SWAC Calculations

Comment Summary

Comments pertaining to effect of sediment background and dredge residual concentrations on post-construction SWAC calculations were submitted by four commenters, as summarized below:

- The post-construction sediment concentrations are unrealistic, and SWACs do not account for dredge residuals or actual background concentrations of COCs. For example, some of the dioxin/furan, PCB, and DDx post-construction concentrations are below EPA's derived background concentrations. Post-construction SWACs less than EPA's arbitrary background concentrations are not feasible and are an artifact of the use of "zeroes," instead of a background or equilibrium-based value, for replacement values in SWAC calculations.
- The use of sediment equilibrium concentrations, such as the equilibrium calculation for PCBs calculated by LWG, are the most appropriate because it is not possible to clean up a sediment site below equilibrium concentrations; however, because equilibrium concentrations have not been calculated for most COCs in Portland Harbor, upstream background concentrations are the next best value to use in these post-remediation SWAC calculations.
- EPA's calculations of post-construction risk do not provide for meaningful comparisons. A larger remedial footprint may briefly result in decreased residual risk in the short period immediately after construction. However, within a relatively short period of time, reflecting a reasonable attenuation time-frame, the post-remedial action risk will be similar across alternatives due to the surface sediments reverting to actual river-wide equilibrium conditions. EPA's analysis fails to properly account for the post-remedy contaminant levels rising to meet background.
- SWACs calculated for SDU RM 3.5E for PeCDD are already near background values of 0.0002 µg/kg. Application of Alternative B RALs, which would not result in designation of an SMA adjacent to the Time Oil facility, would achieve a post construction SWAC of 0.000198 µg/kg, below the PRG. If rolling-river mile, the range is from 0.000116 to 0.000262 µg/kg in this area. If Alternative B RALs were applied, the highest post construction SWAC in this area would be 0.000214 µg/kg at RM 3.9E, essentially indistinguishable from background.

EPA Response

Post-construction COC concentrations in areas assigned to dredging or capping were assumed to be zero, as the 2016 feasibility study report (USEPA 2016b) assumed clean material would be used for caps, and that the residual layer applied to dredged areas would consist of clean sand. This assumption allowed EPA to perform an equal comparative evaluation among the alternatives presented in the feasibility study report. While post-construction sediment concentrations of zero may not actually be realized, there is too much uncertainty during the feasibility study phase to accurately predict what the concentrations will be at each area addressed via active remediation. The absence of sufficient data needed to develop a defensible fate and transport model precluded estimating equilibrium COC concentrations with any degree of certainty in these actively remediated areas for any time-frame beyond the immediate post-construction period. Only empirical data collected post-construction will provide the actual results.

For the purpose of the feasibility study report, assumptions were made in order to evaluate and compare the performance of alternatives. As long as these assumptions are made consistently across

each of the alternatives, the comparative results are not biased based on a largely uncertain and speculative factor such as post remediated sediment concentrations.

EPA's position regarding the use of equilibrium values and the use of zeros as replacement values is further discussed in EPA's response to LWG Dispute Issue 1r and EPA's response to LSS Dispute Issue 8 (Appendix A of this document).

While the commenter is correct that SWACs for 1,2,3,7,8-PeCDD are driving the creation of the SMAs in this area, the SWAC and related RALs for each contaminant were evaluated and established at a site-wide level. The area is not evaluated based on PRGs, and individual areas above the designated RALs are taken into account, not the calculated SWAC at any one area. Figure 3.4-10 in the feasibility study report suggests that at least one sample in the area is above 0.0008 µg/kg and above the background values. This Site will be further evaluated during the remediation and design phase to determine if there is significant contamination and if remedial action is necessary.

2.7.5 Address Inconsistencies between SWACs and Baseline Risk Assessments

Comment Summary

Two comments pertaining to the SWACs being inconsistent with the baseline risk assessments were received and are summarized below:

- The consequences of substantially diverging from the BLRA SWACs at this late date are not considered or discussed anywhere in the 2016 draft feasibility study report or proposed plan. The consequences, combined with other issues, like the zero replacement value, are widespread, impacting every post-construction risk estimate presented by EPA and skewing the overall evaluation of the alternatives' effectiveness.
- It is inappropriate to use any of these new subsampling methods because they will all create Site SWACs that are inaccurate and inconsistent with those used in EPA-approved BLRAs, which in turn causes the remedy selection process to diverge from an appropriate focus on reducing risks actually identified in the baseline risk assessments.

EPA Response

The SWACs are a tool developed for the 2016 feasibility study report (USEPA 2016b) to compare alternatives to the No Action alternative and are not used nor discussed anywhere in the BERA (Windward 2013) or BHHRA (Kennedy/Jenks 2013). EPA's position regarding the two comments above is further discussed in responses to LWG Dispute Issue 1c and 1d (Appendix A of this document).

2.7.6 Effect of Initial Condition SWAC on Chosen Alternative

Comment Summary

Comments pertaining to the impacts of the initial condition SAWC on the preferred alternative were submitted by four commenters, as summarized below:

- Initial Conditions determines the shape of the SWAC curve. When a higher value is used for the initial conditions, the resulting shape of the curve changes and the most intrusive and resource-consuming alternatives erroneously appear to provide more benefit in reducing the SWAC. This is a significant analytical and decision-making error because such alternatives actually provide much less benefit at a significantly greater cost than when the initial condition is more

appropriately represented by the lower actual values that reflect the documented conditions at the Site.

- In the 2016 feasibility study report, EPA used a new, inflated baseline SWAC (almost 2.5 times higher than used in the BHHRA) that resulted in correspondingly higher, but unsupported and unexplained, estimated risks. Such inflation of estimated current risks has the effect of improperly overstating projected risk reductions to be achieved by the more intensive alternatives, including Alternative I.
- A high initial SWAC of 208 ppb for PCBs was used to calculate percent reductions without an explanation or apparent scientific support. This significantly exceeds the initial condition SWAC of 85 ppb derived from the 2001-10 remedial investigation data used in EPA's draft 2015 feasibility study report and the BHHRA. EPA chose not to disregard the data, and EPA's use of the higher current SWAC impacts EPA's detailed analysis of alternatives since using a higher initial SWAC creates the appearance that the more aggressive alternatives achieve greater risk reduction.
- EPA calculated, using the Food Web Model and the new sediment SWAC of 208 ppb, an average PCB site-wide fish tissue concentration of 521 ppb. The comparable average site-wide fish tissue concentration in the BHHRA, based on actual tissue data collected in 2007 and earlier, is 227 ppb, which equates to a site-wide modeled sediment SWAC of 85 ppb. Using EPA's modeled tissue concentration of 521 ppb, the acceptable consumption rate based on the non-cancer endpoint would be 1.9 fish meals/year for the child scenario; whereas the actual BHHRA tissue concentration of 227 ppb results in an acceptable consumption rate of 4.2 meals/year. The above calculation of 1.9 meals/year for Alternative A (baseline) using EPA's fish tissue concentration is higher than the meals per year shown for Alternative A in Figure 4.2-2 of the 2016 feasibility study report, which presents 0.6 fish meal/year for the presumably same scenario. It appears that EPA is using the child scenario but altering the fish meal size from 3.5 ounces to the adult meal size of 8 ounces, which is clearly inconsistent with the BHHRA methods. Putting aside the reasonableness of a child consuming adult meal portions for long periods while still remaining a child, the result of EPA's poorly explained additional change to the exposure assumptions is to drive allowable fish meals even further down for the baseline condition. Combined with the artificially inflated new SWAC, this meal size change compounds the portrayal that the baseline condition is much worse than the actual BHHRA findings. Again, this further increases the perceived benefit of any SWAC and tissue concentration reductions assumed for the more aggressive alternatives.

EPA Response

EPA's response to each of the four comments is as follows:

- While a concern of how the initial conditions affect the SWACs and chosen remedy are valid, the initial condition SWACs presented in the feasibility study report (USEPA 2016b) (Figure 3.4-1) of 92 µg/kg for PCBs is very close to the value of 85 µg/kg used by LWG in 2012. This evaluation is conceptual in nature, and the variations in SWACs across the SDUs are meant to show the effects of the chosen RAL at that level. While these can have an impact on footprints in this evaluation, further evaluation will be done to determine actual extent of contamination and costs during remedial design. A similar question is addressed by EPA in its response to LWG Dispute Issue 1d (Appendix A of this document).

- As stated in the above response, the baseline SWAC of 92 µg/kg was used in calculation of the PCB RAL curves. Please see EPA's response to a similar question in LWG Dispute Issue 1d (Appendix A of this document).
- The initial PCB SWAC of 208 ppb was only used in the risk and surface water evaluations shown in Appendices J and K. For the percent reductions calculated in Section 3 of the 2016 feasibility study report (USEPA 2016b), a value of 92.6 ppb was used as the initial PCB SWAC, and all alternatives were based on this SWAC. This value is close to the 85 µg/kg used in the 2015 draft feasibility study report (USEPA 2015) and only differs based on changes in site area.
- EPA acknowledges there is uncertainty in the analysis of acceptable fish consumption rates. Human health and ecological risk assessment calculations are discussed in Sections 2.33 and 2.34 of this responsiveness summary.

2.7.7 Address Concerns Regarding SWAC Calculations

Specific comments or questions were received from five commenters pertaining to SWAC calculations. Some commenters stated that EPA cites various SWACs without clarifying which SWAC was used in the analyses, or it was unclear how the SWACs were calculated. Others said that methods used for estimating post-construction risks are inconsistent with the baseline risk assessments. For each comment or question, a comment summary and response is provided below.

a. Comment Summary

The BHHRA (Kennedy/Jenks 2013) estimated risk-based on upper bound sediment and fish tissue concentrations for fish consumption. The same approach was not used in the proposed plan assessment. Different data averaging methods and assumptions were utilized for the different SWAC estimates (site-wide vs. rolling river mile, and SDU-wide).

EPA Response

Different methods of calculating SWACs were used as appropriate to the analysis. Site-wide SWACs were utilized to conceptually understand the contamination across the Site as seen in feasibility study report Sections 3 and 4 (USEPA 2016b). SDU comparisons were used to understand how more localized area concentrations were being addressed by the site-wide SWACs. Rolling river mile calculations were deemed to be a more appropriate scale to address the exposure of fish species to contamination as demonstrated in response LSS Dispute Issue 1 (Appendix A of this document).

b. Comment Summary

A commenter stated that EPA cites various SWACs, without clear explanation of what is used in which analyses. The different appendices describing SWACs and 95 percent UCLs on those averages include:

- Appendix B: In Table B1-4, the starting PCB site-wide SWAC is listed as 92.6 µg/kg, presumably related to averaging of the values used in the smallmouth bass exposure areas.
- Appendix I: An uncertainty analysis presents five methods to interpolate surface sediment data. The starting PCB site-wide SWACs are presented as a range from 79 to 205 µg/kg. Appendix I also describes methods to find lower and upper 95 percent confidence limits on the SWACs. A confidence limit of 67 to 95 µg/kg on the natural-neighbor method is presented in text and figures.

- Appendix J: In Table J2.3-1a, the starting PCB site-wide SWAC is listed as 208 µg/kg. According to text on Page J-3, this value is a 95 percent UCL of a SWAC. Region 10 does not explain why it changed the Site-wide PCB SW AC from 85 ppb in the 2015 feasibility study report to 208 ppb in the 2016 feasibility study report. This SWAC is inconsistent with recent evidence that supports an even lower SW AC than 85 ppb. No evidence as to how EPA arrived at number is provided.

The commenter stated that the feasibility study report (USEPA 2016b) and proposed plan (USEPA 2016c) do not fully document which methods were used for which analyses; therefore, the findings from these analyses are difficult to understand. It is not always clear whether an average or a 95 percent UCL is being used, and, depending upon what is presented, the apparent benefits of an action can change. The values used in decision making and remedy selection must be clearly articulated.

EPA Response

In response to the specific comments above, EPA provides the following clarification:

- This value is consistent with the site-wide SWACs presented in feasibility study report (USEPA 2016b) Section 3, Figure 3.4-1, which shows a current SWAC of 92 µg/kg.
- Appendix I presents the uncertainty analysis for comparison to the method used in the feasibility study report and does not present actual PCB values in the feasibility study report. This approach is further described in LWG Dispute Issue 1c included in Appendix A of this document.
- The value of 208 ppb was only used in Appendix J and K and was not used in calculations within the main text of the 2016 feasibility study report (Sections 3 and 4 calculations). This value is explained in response to LWG Dispute Issue 1c. How different SWAC values were used is explained in LWG Dispute Issue 1d. Please see Appendix A f of this responsiveness summary or additional information.

Please see ROD Appendix IV Introduction for an explanation of EPA's updated approach for the site-wide SWAC calculation and evaluations used in updated Appendices J and K in the ROD.

c. Comment Summary

One commenter stated that the descriptions of interpolation and averaging methods in Appendix I of the feasibility study report (USEPA 2016b) lack clarity. In EPA's explanation, it presents four very different maps (Figure I-4) of interpolated PCB concentrations in surface sediment. None of the maps are labeled, and minimal legend elements are provided, so the reader is left to wonder about the various methods being displayed. But the title of the figure, "Four Equally Likely Simulated Maps of PCBs," suggests there is a lot that is not known about the sediment condition.

EPA Response

The method known as conditional simulation is described in Section 2.2.2 of the 2016 feasibility study report (USEPA 2016b) with over a page of text, including a flow diagram describing the intermediate steps supported by three technical references available in the scientific literature. Conditional simulation represents the most advanced state of the science in statistical analysis of spatially correlated data for environmental and geological sciences and mining. The algorithms which form the building blocks of the simulation, P-field simulation and natural neighbor interpolation are well documented in the referenced literature.

The comment asks for more detail with regard to the four equally likely contaminant surfaces shown in Figure 4, lamenting the lack of legend information. The figures are designed to avoid clutter that could cloud the purpose of the figures. These figures illustrate that there is a great deal that is not known about the sediment condition by showing that no individual simulated map is of any greater significance than any other of the 100 equally likely surfaces that were simulated. This is the understanding that was intended to be conveyed by the four maps. Contaminant distributions that are consistent with the sample data are varied, yet despite this level of uncertainty, remedial design and SWAC forecasting involves a great deal of averaging, which ameliorates much of the spatial uncertainty, but not all, as can be seen in the subsequent figures documenting the SWAC vs RAL relationships.

d. Comment Summary

One commenter said that the use of a broad range of percentiles of the contaminant distribution is not an appropriate way to estimate uncertainty in the SWAC. Although there are no statements in Appendix I to indicate that EPA used these estimated uncertainties to estimate post-construction risks or to select the preferred alternative, page 4-9 of the 2016 feasibility study report (USEPA 2016b) main text reads:

> *"The analysis showed that for some alternatives, the uncertainty bounds of the post-remedial SWAC overlap the uncertainty bounds of the pre-remedial SWAC. This indicates that there is potentially no remedial benefit for those alternatives because the pre- and post-remedial SWACs are statistically indistinguishable when uncertainty in the SWAC estimates are taken into account."*

The statement that "those alternatives ... are statistically indistinguishable" is not correct, and suggests that Alternatives B and D were found to not meet the threshold criteria for protectiveness because of the perception that they are "statistically indistinguishable" from Alternative A. The assertion that datasets with wide ranges of concentrations with potentially overlapping confidence limits on the mean are statistically indistinguishable is flawed, and EPA should not use this faulty premise to favor more aggressive remedies. Further, there is a lack of clarity on the reason that Alternatives B and D were considered protective in the draft feasibility study report (USEPA 2015), but not in the 2016 feasibility study report.

EPA Response

Remedial actions are compared based on predictions of post remedial SWAC which are subject to statistical uncertainty because they are estimated from samples. The sample data are based on a combination of biased and unbiased sampling programs which preclude use of simple statistical methods that require unbiased probability based sampling designs. Under the assumption of positive spatial correlation, biases can be approximately corrected through spatial weighting, and uncertainty bounds can be developed through application of geostatistical models. In the feasibility study report (USEPA 2016b), the standard geostatistical approach based on conditional simulation was applied to data from the Site and resulted in point estimates of the mean (SWAC) as well as the best available 95 percent confidence limits, conditional on the non-probability based sampling design.

Using standard statistical procedures, such as a Student's T interval or a bootstrap confidence interval when confidence intervals do not overlap, one can draw the conclusion that the means differ with more than 95 percent level of confidence. Equivalently, one would reject the null hypothesis of equal means with a statistical significance of less than 5 percent. When intervals overlap slightly, it is possible that the means differ at the 5 percent level of significance. However, when intervals overlap substantially, such as when an interval captures the mean, one can conclude that the difference in means is not statistically discernable—they are indistinguishable at the 95 percent level of confidence. When

intervals overlap slightly, they may differ at the 5 percent level, but as the overlap increases the level of statistical significance of the difference increases (they become statistically indistinguishable).

EPA could develop specific estimates of the statistical significance of the difference in estimated SWACs for each alternative; however, visual inspection (identifying differences that are clearly discernable practically and statistically) provides a more pragmatic evaluation and identifies differences in SWAC that are well outside the margins of statistical error. It would be irresponsible for EPA to select a remedy that could not be reliably predicted to provide the level of SWAC reduction necessary for risk management. Estimation of the SWAC and its uncertainty bounds is approximate because of the lack of rigorous probability based sampling design, so it would be foolhardy to search for exact levels of statistical significance that themselves are only approximate.

Rather, a more appropriate approach would be to follow up the feasibility study report process with remedial design sampling to verify the geostatistical model and improve spatial resolution of deposit boundaries, to reduce uncertainty in SWAC projections associated with the final design.

e. Comment Summary

Several comments were submitted that are related to the SWAC evaluation in Appendix J, of the 2016 feasibility study report, as summarized below:

- EPA has a flawed baseline calculation for PCB SWACs of 208 ppb in Appendix J which is in conflict with the 92 ppb used on Figure 3.4-1 in the 2016 feasibility study report. This is an unexplained inconsistency in EPA's methods as none of the text, figures, or tables explain this value.
- Our current understanding is that the EPA value of 208 ppb derived in Appendix J may be completely separate from the value of 205 ppb described in Appendix I, and they are only coincidentally similar. This remains unclear.
- The Appendix J method of calculating site-wide SWACs appears fundamentally flawed. EPA is indicating that the Site was cut into 31 subareas, and a SWAC was "computed" for each subarea. EPA then made the assumption that the SWAC for each subarea was somehow a potentially representative "sample" of the entire Site SWAC, which is clearly an inaccurate and scientifically unsupportable assumption. Empirical data collected over 15 years irrefutably demonstrate that the Site has areas with relatively high and low PCB (and other chemical) concentrations, and the SWAC in any given subarea may have little relationship to the overall surface-weighted average across the entire Site. By selecting the concentration from one subarea to represent all post-construction risk estimates for the entire Site, EPA is deciding that all human health and ecological exposures represented by any particular RAO or scenario occur in that one subarea. In other words, while a given BHHRA scenario may assume a person is catching fish from the entire Site, EPA's feasibility study method reduces this assumption to a person catching fish from just one select subarea for the entire exposure period. Additionally, because EPA is using an upper prediction limit (UPL), this person is assumed to consume only fish from an area with comparatively high concentrations.
- EPA indicated they calculated averages within each SDU and then placed those values in its ProUCL software to generate a 95 percent UCL. The method described is technically incorrect because it gives equal weight to river segments (SDUs) with different surface areas. EPA should document the method used clearly in the feasibility study report to support its decision, and EPA

should revise its method because the method indicated is not defensible, especially when it is relied upon by EPA to promise risk reduction for it proposed highly expensive remedial alternatives.

- EPA's selection of the preferred alternative is based upon an overconfidence in its estimated SWACs, which in turn are used to estimate tissue concentrations and the corresponding fish consumption risks. For example, the calculated site-wide cancer risk for Alternative B is 4×10^{-4}, whereas Alternative D is associated with a 3×10^{-4} risk (Tables J2.3-1b and c). Within the uncertainty in the starting SWAC alone, and with regard to the other issues noted, these two numbers are not different from one another, and EPA's selection of its Preferred Alternative is not justified.

EPA Response

In response to the specific comments above, EPA provides the following clarification:

- The value of 208 ppb was only used in Appendix J and K and was not used in calculations within the main text of the 2016 feasibility study report (Section 3 and 4 calculations) (USEPA 2016b). This value is explained in response to LWG Dispute Issue 1c.
- The value of 208 ppb is not related to the 205 ppb used in Appendix I. The 205 ppb is part of the uncertainty analysis and is only meant to represent the range of values based on different methods.
- EPA's response to this comment is discussed in LWG Dispute Issue 1c (Appendix A of this document).
- The response described is actually the method used in Appendix J to calculate initial SWACs. This method is defended in EPA's response to LWG Dispute Issue 1c (Appendix A of this document).
- EPA's selection of its preferred alternative was not based on a risk – the data found in Appendix J was not used to determine the Alternative but to evaluate the alternatives. The SWACs were evaluated separately for the risk and surface water calculations in Appendices J and K of the 2016 feasibility study report.

Please see ROD Appendix IV Introduction for an explanation of EPA's updated approach for the site-wide SWAC calculation and evaluations used in updated Appendices J and K in the ROD.

f. Comment Summary

One comment stated that the feasibility study report and proposed plan do not fully document which methods were used for which analyses and, therefore, the findings from these analyses are difficult to understand. It is not always clear whether an average or a 95 percent UCL is being used, and, depending upon what is presented, the apparent benefits of an action can change. The values used in decision making and remedy selection must be clearly articulated. The commenter further stated that in Appendix J, post-construction rolling river mile and SDU average calculations are presented, but they appear to have no relationship to the SWAC calculations described in Appendices B or I (PRG Development and SWAC Uncertainty, respectively) because the data and methods used in all of these appendices (B, I, and J) are ambiguous. The phrase "These sediment concentrations were input into the FWM ... " (in the first paragraph of Section J2.3) apparently refers to site-wide SWAC values, but it does not specify whether the concentrations are derived from a straightforward application of the nearest-

neighbor method or whether the uncertainties were derived from conditional simulations which were used to derive a UCL for the SWAC that was used for the risk assessments.

EPA Response

The method used to develop SWACs used in development of technologies and costs in feasibility study report Sections 3 and 4 are presented in Appendix D of that report (USEPA 2016b). Appendix D discusses the development of site-wide SWACs (Section D1), as well as SDU and rolling river mile SWACs developed to facilitate the evaluation of protectiveness and long-term effectiveness in the feasibility study report. The same method was used to develop the site-wide sediment SWACs presented in Appendix B of the feasibility study report. Appendix I presents an uncertainty analysis that is not used in any additional calculations. Appendices J and K use alternative methods to evaluate risks to environmental and human health. These alternative methods are useful as supporting material and do not contradict the methods presented in the feasibility study report. Please see the replies to the above comments b, c, and d in this subsection for additional clarification on Appendices I, J, and K.

g. Comment Summary

One commenter said that an unstated assumption is that the 31 subareas defined by EPA are a statistically valid way of dividing the Site. EPA clarified that the subareas are based on SDUs, which EPA states were devised to specifically identify the areas of highest COC concentrations on a rolling river mile basis. Many other methods could be used to define subareas of the Site, each of which would yield different statistics than the one EPA selected. Further, EPA has created an explicitly bimodal distribution of subareas, with some subareas focused on the highest observed concentrations (the SDUs) and remaining subareas focused on the lowest observed concentrations. This method is biased and inherently inaccurate for subsampling Site SWACs, and consequently, it is likely that other less biased and more scientifically supportable subsampling methods would produce a lower overall SWAC estimate.

EPA Response

EPA performed the approach as summarized by the commenter and made assumptions based on transparent and data supported rationale to perform a comparative evaluation among the alternatives presented in the feasibility study report (USEPA 2016b). The commenter does not provide any supporting information revealing how this approach is biased and only presents assertions of bias on the approach and speculates on the outcome of these assertions.

2.8 Habitat

2.8.1 Prevent and/or Mitigate Loss of Habitat

Comment Summary

Nineteen personal comments were received that focused primarily on a desire to prevent habitat loss and to restore lost habitat (paid for by the PRPs) where prevention of loss was not possible. Some commenters believed that preservation of habitat should have been included in the proposed plan.

Representative comments include:

- "Restoration of any lost habitat needs to be a requirement of the final remedy. The proposed plan refers to restoration, and this restoration must comprehensively include actions following removal actions."

- "Ensure restoration of all lost habitat and of water quality, such that fish are edible without an advisory."
- "We fully support a clean-up plan that makes habitat viable for native fish—migratory and resident. EPA should also consider how we can connect the cleanup requirements to the different limiting factors affecting listed salmon populations and other native resident fish. It seems that the ecological Remediation Action Objectives are solely focused on disrupting the accumulation of Contaminants of Concern up the food chain. This is important, especially from a human health perspective, but seems to ignore the salmon recovery needs for Willamette River populations. The Plan should consider potential impacts and benefits to juvenile and migrating salmon. The clean-up requirements should incorporate the in-depth knowledge of habitat needs throughout the North Reach of the Willamette River, especially for juvenile salmon. This includes ensuring consistency between clean-up option selection, clean-up project design and mitigation, and the Natural Resources Damages process already underway. Mitigation for the negative impacts of cleanup activities on those species should begin immediately. Ideally, the cost, community acceptance, and long-term effectiveness criteria would all consider options that help meet the multiple ecological and habitat restoration needs for this reach of river."
- "More emphasis on upland habitat recovery and restoration."
- "Protect shorelines, nearshore habitat, and communities residing nearshore."
- "Restoration of habitat. Wildlife do not have the luxury of avoiding the 10-miles of the lower Willamette River. It is an important part of the watershed and serves as a migration pathway and habitat for several important endangered or declining species: Chinook salmon, steelhead, Lamprey eel and white sturgeon. Adults migrate upriver to spawn and juveniles migrate down river to the Columbia and ocean. Since all species require habitat, especially off-current or shallow water habitat for rest, feeding and to avoid predators, it is vitally important to restore habitat as soon construction occurs. MNR, capping and dredging will disturb and degrade habitat by reducing diversity of vegetation and other amenities, so restoration of vegetation and other habitat amenities needs to occur during construction, not only as part of the NRDA program. The funding for restoration of habitat should be fully paid for by Potentially Responsible Parties."
- "There is no real plan for the restoration of lost habitat."
- "The plan should protect and enhance existing fish and wildlife populations and habitats. Cleanup actions should reconnect existing and potentially favorable habitats. 4. Cleanup and management of contaminated materials should support restoration and protection of processes that maintain watershed health – normative hydrology, functioning physical habitat, improved water quality, and healthy native biological communities."
- "Habitat restoration in perpetuity fully paid by PRPs. Restoration of any lost habitat needs to be a requirement of the final remedy. The proposed plan refers to restoration, and this restoration must comprehensively include actions following removal actions."

EPA Response

EPA understands the commenters' concerns about habitat loss resulting from the cleanup. The feasibility study described the role that Section 404 of the Clean Water Act and Oregon mitigation regulations have as action-specific ARAR for the Portland Harbor remedy at page 2-5:

- "Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into navigable waters, with the exception of incidental fallback associated with dredged materials. This ARAR is applicable to cleanup actions in navigable waters of the Site that will discharge dredged material or capping material into the Willamette River or adjacent wetlands, including the specification of in-river disposal sites. The alternative evaluation process includes considerations of the Clean Water Act hierarchy to avoid or minimize loss of aquatic habitat or function, but if a loss was deemed unavoidable, mitigation will be included as part of the alternative. A 404(b)(1) analysis of the remedial alternatives is provided in Appendix J [L]. The final assessment of loss and determination of mitigation will be made during remedial design. In addition to Section 404 of the Clean Water Act, ORS 196.825(5) and applicable substantive mitigation rules found at Oregon Administrative Rules 141-085-510, 141-085-680, 141-085 0685, 141-085-0690, 141-085-0710, and 141-085-715 provide requirements for mitigation for the reasonably expected adverse effects of removal or fill in a project development in waters of the state, including in designated Essential Indigenous Anadromous Salmonid Habitat."

Similarly, the remedy must comply with the substantive requirements of the Endangered Species Act, which protects salmon and other species that may be present at the Site. This issue is further detailed in the feasibility study report at page 2-4 (USEPA 2016b). Section 7 of the Endangered Species Act requires that actions authorized by federal agencies may not jeopardize the continued existence of endangered or threatened species or destroy or adversely modify critical habitat. ROD Section 15.2.3 discusses compliance with ARARs.

Appendix L of the feasibility study report describes the impact avoidance and minimization measures that would be implemented during cleanup activities to protect aquatic habitat. All alternatives analyzed included measures to minimize habitat impacts, particularly where dredging and capping was proposed for the shallow region of the river as described in more detail below. A draft programmatic biological assessment was drafted and shared with U.S. Fish and Wildlife Service and National Marine Fisheries Service for review and comment. Their input on appropriate consideration of impacts and measures to mitigate these impacts is reflected in the proposed plan (USEPA 2016c) and the ROD. During remedial design, avoidance and minimization measures will be developed according to the specific conditions of each cleanup area, and further review and coordination with National Marine Fisheries Service and the U.S. Fish and Wildlife Service will occur.

As described in the feasibility study report Appendix L, there would be unavoidable short-term impacts on habitat for fish and other aquatic species in areas where dredging, capping, or ENR would occur. These short-term impacts are primarily associated with the disturbance to the benthic community from these activities in nearshore areas. Following the cleanup activities, a mix of rounded small gravel, also known as "beach mix", would be placed over the surface of the remediated river bottom, where appropriate. Beach mix provides appropriate substrate to allow the benthic community to recover, which is expected to take a few months. Removing the contamination from the aquatic food chain through dredging, capping, and ENR will provide substantial benefits to aquatic species, including federally listed salmon.

To avoid or minimize potential permanent adverse impacts on aquatic habitat and river bank habitat resulting from the cleanup there are several measures proposed. These measures include any area assigned dredge/cap in the shallow region will first be dredged to the depth of the cap, and any area assigned dredge only will be backfilled to existing grade with a beach mix cover to leave the appropriate

water depth and shoreline slope to maintain shallow water habitat important for many species, including juvenile salmon. In addition, riparian vegetation, bank layback, large woody debris, and other components of shoreline habitat may be provided where possible following construction of such areas. Habitat aspects of other depth zones would also be considered, where appropriate. These measures would be developed in coordination with National Marine Fisheries Service, and U.S. Fish and Wildlife Service.

Where unavoidable temporary or permanent loss of habitat may occur from the cleanup, specific requirements for compensatory mitigation would be developed during remedial design. Compensatory mitigation projects could entail converting existing upland habitat to shallow water habitat, reducing bank slope angles and adding riparian vegetation, and/or re-connecting to off-channel habitat. Such projects likely would require the appropriate sand/gravel substrates, shallow slopes, and shoreline complexity to benefit salmon and other aquatic species. These projects would likely be constructed in the lower Willamette River and/or the Columbia River, with a preference for projects to be undertaken as close to the impacted area as possible.

Restoration of habitat impacts site-wide as a result of releases of hazardous substances and petroleum will be addressed by the Natural Resource Trustees, which will include habitat restoration work above and beyond compensatory mitigation that EPA can require under the Clean Water Act 404(b)(1) and Endangered Species Act.

2.8.2 Revegetate to Promote Habitat

Comment Summary

Twenty-three comments were received that focused on revegetation. All but two were part of form emails and stated

- "Habitat restoration following remedy construction needs to be a required element in the R.O.D. Aquatic habitat that is disturbed by the remedy must be restored and the full cost paid by the PRPs. When nearshore and intertidal habitat has to be removed, it must be replaced and replanted with SAV [submerged aquatic vegetation] that thrives."

The remaining two comments had more detailed suggestions for revegetation. They included:

- "Financially offer responsible parties to reduce dollars spent by offsetting carbon emission with carbon sequestering. The federal farm bill has money for public and private lands to use federal funds to kick start carbon forest which equals phytoremediation and a hopeful future for all living creatures that inhabit the Willamette River sites."
- "I petition and request:
    - 1. A phytoremediation and carbon sequestering plan be put into Portland Harbor Superfund Clean Up plan and to be implemented in all toxic affected areas along the Willamette River bank. What's important is the type of trees, shrubs and flowers, (including but now exclusive to native plant life) incorporating all aspects of companion planting and the use of new science (year-round habitats developed from Bee Baseline Portland Project) and information from the book written by Kristen Ohlson "*The Soil Will Save Us*," regarding how to sequester/create a carbon soil/forest. I have a detailed list of trees, shrubs and flowers and how each plant will

best serve present and future hope for clean soil, water and air along the Willamette River.

- 2. Financially offer responsible parties to reduce dollars spent by offsetting carbon emission with carbon sequestering. The federal farm bill has money for public and private lands to use federal funds to kick start carbon forest which equals phytoremediation and a hopeful future for all living creatures that inhabit the Willamette River sites.

- 3. Best trees, shrubs and flowers needed are a variety and what's required a minimum of a 120 total. Here are a few plants listed here. Cotton Wood (Both male and female) Ponderosa Pine, Madrone, Pink and White Crepe Myrtle, Witch Hazel, Doug Fir, Sitka Spruce, Black Hawthorne, Vine Maple, Poplar, Elm, Forsythia, Daphne, Crocus, Aster, Germander, Geranium, Ribes, White Rock Rose, Potentilla, Rosemary, Fennel, Oregano, Thyme, Sky Pencil Holly, Oak Leaf Hydrandea, Snow Berry, Fushia Rock Rose, Crocosmia, Camilla Japonica, Winter Sweet, Black and Blue Salvia, Floribunda Yellow Rose, Salvia Farinacea, Basswood Lynden, Lavendula, Lavender, Heather, Anenome, Abelia bush, Bacopa, Curly Willow, Blue Russian Sage, Hibiscus, Ceanothus, Ivory Silk Lilac Tree, Mock Orange Tree are a good start to what can really transform the toxic past into a heroic present and future. Thank you and Good Luck. I am available if you have any questions. I am happy to help anyway I am able. Thank you, thank you, thank you for the health and happiness of all living creatures in Portland."

EPA Response

As described in Appendix L of the feasibility study report (USEPA 2016b), aquatic and river bank habitat impacted by the cleanup will be mitigated by best management practices and on-site measures. These measures include:

- Following dredging in shallow water areas (0 to 20 feet from ordinary low water), backfill would be used to restore the existing (pre-dredging) elevation to avoid loss of shallow water habitat.

- To offset permanent and/or temporal loss of habitat functions from dredging and capping in shallow water areas and as on-site mitigation, following dredging and capping in shallow water areas, slope would be laid back to as close the existing slope as practicable given site-specific conditions.

- To further offset permanent and/or temporal loss of habitat functions from dredging and capping on river banks and as on-site mitigation, after soil removal on river banks, river bank slopes would be laid back to as close as a 5H:1V slope as practicable given site-specific conditions.

- Capping in shallow areas would specify dredging of an equivalent cap thickness prior to placement to allow for a net zero bathymetry change and avoid loss of shallow water habitat.

- Engineered beach mix layer, consisting of rounded gravel typically 2.5 inches or less would be applied to the uppermost layer of all caps and dredge leave surfaces in shallow areas. This layer would provide appropriate substrate habitat for colonization by benthic organisms. Beach mix would not be applied to leave surfaces consisting of sand unless required due to changes in

hydrodynamic conditions following remedial activities. In addition, if beach mix is placed over riprap armoring, monitoring would be required to determine whether the site-specific conditions are conducive to maintaining the beach mix habitat layer over the riprap. If monitoring or site-specific modeling demonstrate that a sand/gravel surface can be maintained long term, this may be considered by EPA when determining if the compensatory mitigation proposed during remedial design is adequate.

- Vegetation would be incorporated into caps placed on river banks where possible such as in off-channel areas that are not prone to erosion and with less steep slopes.

Vegetation appropriate for the riparian habitat would likely include willows, cottonwoods, and other native plants that control erosion and provide wildlife habitat. Monitoring may include ensuring invasive species are controlled while native species take hold in these areas. Submerged aquatic vegetation is expected to colonize naturally once the sediment contamination is remediated and appropriate substrate is restored in nearshore areas. Please see the ROD for more details on river bank and nearshore design considerations.

Phytoremediation was evaluated as a remedial technology and screened out in the first step of screening. As indicated on Table 2.4-1 of the feasibility study report, phytoremediation and other in-site biological treatment technologies are not considered feasible to implement because some contaminants are either not biodegradable (particularly heavy metals) or are very persistent in the environment (such as dioxins/furans, PCB, and pesticides).

In-situ treatment with activated carbon and other materials, is sometimes referred to as “sequestration,” as identified in Tables 2.4-1 and Table 2.4-2 of the feasibility study report. This was retained as an in-situ treatment technology process option and will be further evaluated during remedial design when detailed plans for the cleanup at specific areas are developed.

EPA may also support carbon sequestering and other technologies to reduce the carbon footprint of the cleanup, in accordance with the green remediation approach. This could be implemented as part of the Green Remediation Plan for reducing environmental impacts during the cleanup, but is not a remediation technology to address the contamination itself.

2.8.3 Ensure Caps Do Not Reduce Habitat through Flood Rise

Comment Summary

Two comments were received on shallow areas, as they relate to habitat:

- “In order to minimize impacts to the aquatic environment and flood rise, EPA has determined that all cap areas in the shallow regions need first to be dredged to a depth equal to the cap thickness and any dredge areas will be backfilled to pre-dredge grade. EPA provides no explanation as to why flood-rise considerations are any greater in shallow regions than in other regions of the river. Its focus should be on aquatic environment and slope stability. The ultimate post-cleanup elevations in shallow regions should be designed to establish the best aquatic habitat and bank stability possible. There is no reason for EPA to strictly prescribe that shallow region elevations should remain unchanged.

  There are many unique features of the near-shore shallow region offshore of Gunderson, largely as a result of fill and regrading that occurred decades ago, long before Gunderson's ownership.

EPA needs to provide more flexibility in terms of the possible design of dredging and capping in these near-shore areas."

- "Does the plan allow the City to retain adequate flexibility to mitigate for future floodplain impacts in the North Reach of the Willamette unrelated to Superfund? For example, over reliance on capping or leaving excessive amounts of contamination in place, could result in a situation in which there may not be adequate opportunities available to mitigate for future industrial development activities within the floodplain in the North Reach. This could result in a situation where either development is precluded or in which mitigation costs increase because mitigation has to be done outside the North Reach rather than in close proximity to the actual impact area."

EPA Response

Aquatic habitat and flood rise/adverse floodway impacts are two significant ARAR considerations for using and designing caps in the Willamette River. Balancing of dredge and fill volumes to the maximum extent practicable is assumed to limit flood rise throughout the Site. Also, a goal of the cleanup will be to not adversely affect floodplain capacity or cause floods to encroach upon new areas by increasing base flood elevations of the Site. Therefore, the cleanup should not impact the city's future decisions on floodplain developments and mitigation options. See Section 2.19.11 of this responsiveness summary for more response on flood rise issues.

A flood rise analysis was undertaken on the remedial alternatives in the feasibility study to generally assess the feasibility of using caps at the Site. Impacts on aquatic habitat were considered for the shallow region as identified in Section 3.4.7.5 and Appendix L of the feasibility study report (USEPA 2016b). More detailed modeling will be conducted during remedial design on both an SMA and site-wide scale to demonstrate that remedial actions do not result in unacceptable flood rise.

The Clean Water Act Section 404 requires avoiding or minimizing impacts to the aquatic environment, and EPA is coordinating with the NMFS on measures to protect habitat for listed species, including juvenile salmon, which depend on shallow water habitat at the Site. In its comments on the proposed plan (USEPA 2016c), NMFS has strongly recommended limits on conversion of shallow water habitat to "submersible lands" (areas that would not be constantly submerged). To that end, NMFS recommends "reducing the repose of shorelines and removal of streambank fill to expand the floodway and active channel" (Section 4).

EPA intends to follow the recommendations of the NMFS, to the extent feasible, to avoid or minimize impacts on shallow water habitat. During remedial design, a detailed evaluation of area-specific conditions would be conducted. The ROD allows for flexibility in selection and design of remedial technologies based on information collected during remedial design. That said, EPA reiterates the goal of avoiding or minimizing effects on aquatic habitat, particularly to listed species and their critical habitat in compliance with the Clean Water Act and the Endangered Species Act.

2.8.4 Consider Habitat Restoration

Comment Summary

One comment was received from the Audubon Society that addressed the topic of habitat restoration. It stated in part:

- "The Clean-up Plan and F.S. should address the recent Biological Opinion released by National Oceanic and Atmospheric Administration Fisheries regarding the National Flood Insurance

Program. We question whether compliance with the BiOp should be considered an ARAR. Does the plan comply with the specific terms of the BiOp such as avoiding construction in the floodway, fully mitigating for construction that adversely impacts salmonid habitat both in the river and on adjoining floodplains, and providing balanced cut and fill for to compensate for any filling in the floodplain?

The Plan should include a much clearer description of the natural resource mitigation that will be required to compensate for habitat loss and other loss of natural function resulting from the implementation of the remedy. The discussion of natural resource mitigation that will be required as a result of implementation of the remedy (as opposed to mitigation that will be required under NRDA to compensate for impacts of contaminants on wildlife and other natural resource values), is cursory. EPA should more clearly define the local, state and federal laws under which mitigation will be required. EPA should include in this estimate, mitigation that will be required under NMFS' NFIP Biological Opinion. It should also consider requirements under local regulations such as the city of Portland Greenway Code."

EPA Response

The NFIP Biological Opinion is not an ARAR for the CERCLA cleanup. First, it does not meet the definition of an applicable or relevant and appropriate requirement as defined in the NCP. Secondly, the NFIP Biological Opinion relates to Federal Emergency Management Agency responsibilities in implementing the flood insurance program and sets forth requirements for local communities regarding how to manage floodplains and development within a floodplain.

Response to Comment 1a: The CERCLA cleanup, however, must meet the substantive requirements and goals of Federal Emergency Management Act regulations at 44 CFR § 9, which set forth the responsibilities to implement existing Executive Orders on management of floodplains and protection of wetlands. See EPA's ARARs tables (25 a through c) in the ROD Appendix II. The substantive Federal Emergency Management Agency regulations are relevant and appropriate for assessing impacts, if any, to the floodplain and to flood storage capacity from the response action.

As the commenter noted, while natural resource damage restoration is not in EPA's purview, the cleanup will need to comply with the substantive requirements of the Clean Water Act, Endangered Species Act, and state regulations related to compensatory mitigation that may be required due to unavoidable loss of habitat, if any, resulting from the cleanup EPA's feasibility study alternatives analysis as informed by the Flood Rise and Clean Water Act Section 404(b)(1) analyses in Appendices P and L, respectively, and the final selected remedy, incorporates requirements for how dredging and capping designs must result in no rise of the bottom of the river and measures that will be taken to avoid or minimize impacts to habitat from the cleanup. See the ARARs tables (ROD Appendix II) for a list of all the federal and state laws and regulations that relate to floodplain and habitat mitigation.

The ROD describes various mitigation measures that will be required for cleanup actions taken in specific areas of the river, with a preference for these to be conducted on-site whenever possible. EPA is and will continue to coordinate with NMFS on measures to protect habitat for listed species. Because the contamination is located in the floodway itself, it is not possible to avoid the floodway when conducting the remedial "construction" activities associated with the cleanup. During remedial design, the extent of unavoidable loss of habitat, if any, will be determined, and specific compensatory mitigation requirements will be developed in coordination with NMFS and state resource agencies.

EPA will prioritize mitigation measures to be taken on site, or as close to the area of impact as possible, which will be constituted primarily with shallow zone and river bank areas critical to Endangered Species Act species. Where necessary, off-site mitigation work may be needed due to lack of available areas to conduct the on-site work. EPA will also seek to work with private companies to obtain approval from the USACE and Oregon Department of State Lands for mitigation banks under Clean Water Act 404 close to or within the Site such that parties unable to fully mitigate on site have a fully approved option to remedy habitat impacts as quickly as possible to minimize temporal impacts to the Lower Willamette ecosystem.

Appendix G of the feasibility study report (USEPA 2016b) explains how such mitigation costs were calculated from the average cost of other sediment cleanup projects in the Pacific Northwest, including the Lower Duwamish and Commencement Bay (Hylebos). Mitigation costs for each project were escalated to the base (current) year of the estimate for averaging.

2.9 Alternative Evaluation

2.9.1 Explain Deficiencies in the Alternative Evaluation Process

Comment Summary

Comments were received from about a dozen sources, including businesses, City of Portland, CAG, Swan Island Lagoon Group, and Portland Audubon Society that related to the evaluation process for alternatives in the feasibility study.

Several of the commenters stated that the evaluation of alternatives is deficient for one or more of the following reasons:

- EPA should evaluate sustainability of the alternatives.
- Alternative I relies too heavily on ICs to prevent exposure; ICs do not protect ecological receptors and are potentially ineffective against human exposure as well.
- There are numerous problems with determining that B, D, E and I are not protective and a specific example is the evaluation of BEHP evaluation around Swan Island Lagoon.
- EPA's alternative evaluation is flawed because it is based on an inaccurate CSM, there is an error with the cleanup area, it ignores recent data, and EPA used an over simplified approach.
- The evaluation did not include site-specific factors and does not consider implementability challenges.
- The quantitative bases to compare rates and levels of risk reduction lack reason.
- Risk reduction from fish consumption is not apparent and attainment of cleanup goals is not clearly evaluated.
- EPA has underestimated the effectiveness of Alternatives B and D.
- The statistical methods used to evaluate alternative effectiveness are unclear and technically suspect or flawed.

- EPA did not evaluate PTW treatment and application of activated carbon equally under all alternatives.
- Does not included a quantitative or detailed short- or long-term effectiveness evaluation.
- Cost and cleanup benefit of alternatives not fully evaluated in the feasibility study.

Many commenters disagreed with the conclusion of a specific alternative's protectiveness and expressed confusion as to why some alternatives were determined not to be protective. Additionally, some suggested that a more robust evaluation of alternatives needs to be conducted, which may include supplemental analysis or modeling. The maps in the proposed plan do not show the remediation area extending to the back of the Swan Island Lagoon. The preferred alternative is clearly not better than the other alternatives.

The CAG and Audubon request that Alternative G or G Modified be selected as the remedy and that protecting human health (including by addressing frequently used portions of the Site) and the environment is a priority. Many commented that the protectiveness analysis for some alternatives was confusing or incorrect. PTW should be removed due to its toxicity and to prevent future releases. Alternative G should be modified to include more dredging, treating more shoreline and benthic risk areas, revisit navigational restrictions, and reduce the schedule for implementing the remedy.

The Swan Island Group commented that an optimized remedy for Swan Island Lagoon has been developed and accounts for risk reduction associated with ENR. The optimized remedy would cost less to implement than the preferred remedy and would achieve equivalent risk reduction. EPA should only require treatment when contamination contributes to known risks. It is unclear what assumptions were used when estimating residual contaminant concentrations and risks.

The City of Portland requested that, after cleanup has been completed in a small area that people frequently use, EPA should evaluate the cleanup's performance.

EPA Response

The alternatives analysis in the feasibility study and as supplemented to include Alternative F Modified complies with the NCP requirements in 40 CFR § 300.430(e). The development and evaluation of alternatives sufficiently reflects the scope and complexity of the site-wide remedial action under consideration and the site problems being addressed. The CSM complies with EPA guidance and is based on data collected by LWG under EPA oversight. The alternative evaluation included models and various analysis tools that were appropriate for evaluating the alternatives under the first seven criteria.

Based on consideration of the requirements of CERCLA, the detailed analysis of remedial alternatives, and public comments, EPA has selected Alternative F Modified as the final remedy. Sections 11, 12, 13, and 14 of the ROD describe the selected alternative and justification for selecting Alternative F Modified as the remedy. The ROD contains the comparative analysis of the alternatives with Alternative F Modified, including the evaluation of the overall protectiveness of Alternative F Modified. The selected remedy is more protective than Alternative I because it is more permanent and Table 22 of the ROD shows the quantitative increase in the number of meals, which correlates with an increase in the area being dredged. Alternative F Modified addresses all ecological risk upon completion of construction. Immediately after construction of the selected remedy, it is estimated that wildlife will be able to safely consume prey from within the Site since all non-cancer risks on a site-wide scale will be addressed. It is

estimated that BEHP will be at a HQ of 5 at a river mile scale and 3 at an SDU scale, very close to the target of 1 and well within potential calculation variances.

The evaluation in the feasibility study was based on post construction sediment concentrations rather than long-term projections due to the uncertainty in any long-term projections of sediment concentrations and associated risk to human health and the environment. Implicit in this approach is the assumption that alternatives that have a larger remedial footprint will achieve the remedial action objectives established for the Site in a shorter time frame than alternatives with a smaller footprint as they rely less on MNR, this assumption is supported by the updated T=0 charts presented in Appendix IV of the ROD, which show incremental reduction in risk over river mile segments for the RAOs. A supplemental analysis, using SEDCAM to evaluate MNR trends of average PCB concentrations for each alternative post-construction, is included in Appendix IV of the ROD. This analysis helps show the protectiveness of each alternative.

After clean-up levels and RAOs are achieved, the long-term effectiveness of the remedy will be monitored. The ROD describes monitoring requirements in Section 14.2.7. Additionally, the expected cleanup outcomes/performance from Appendix J of the feasibility study report (USEPA 2016b) are updated for the selected remedy and included in Appendix IV of the ROD.

EPA disagrees with the statement that EPA determined that Alternatives B, D, E and I are not protective, with a specific example being a BEHP evaluation around Swan Island Lagoon. In fact, Alternative I was the preferred alternative in the proposed plan (USEPA 2016c). EPA also concluded that Alternatives B and D were protective of human health because ICs can be set in place to ensure protection until such time as cleanup levels are achieved. However, since ICs cannot be placed to ensure protection of the ecological receptors, EPA concluded that these two alternatives were unlikely to be protective of the environment because MNR would not occur in a reasonable time frame. The determination was not made solely based on benthic risk but rather on a more broad-based evaluation consistent with EPA guidance. Consistent with the NCP, overall protectiveness draws from assessments of the other criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. An uncertainty analysis presented in Appendix I of the feasibility study report was considered as well. Additional discussion of effectiveness is included in Section 2.19 of this responsiveness summary.

Based on recommendations from the NRRB/CSTAG (see NRRB/CSTAG comment on Remedy Performance, p. 5), EPA performed an uncertainty analysis of each alternative to determine the likelihood that the alternative would be significantly different from the No Action alternative. This analysis was presented in Appendix I of the 2016 feasibility study, and the conclusion was that Alternative B post-construction SWACs were statistically indistinguishable from the No Action alternative and that the post-construction SWACs for Alternative D were still within the margin of error relative to no action. Since the No Action alternative was deemed to not be protective, EPA determined that Alternatives B and D are also not protective since Alternative B was statistically indistinguishable from the No Action alternative, and Alternative D was only slightly better for PAHs and PCBs (DDx RALs for Alternative D were also statistically indistinguishable from the No Action alternative).

For further details regarding the evaluation of Alternatives B and D, refer to LWG Dispute Response 1a (Appendix A of this document).

Alternative C was eliminated based on:

- The small incremental increase in quantities of dredge and borrow materials between Alternatives B and C.
- The relatively small incremental decrease in focused COC concentrations when compared between Alternatives B and D or C and D.
- The differences between Alternatives B and C include only a 0.1 percent increase in overall acres remediated with only a corresponding average 9 percent reduction of focused COC concentrations in surface sediment.

It was concluded that Alternative C was not distinctly different from Alternative B and therefore it was eliminated.

Some comments describe generally that the evaluation of alternatives is incomplete and fails to meet requirements of CERCLA or the NCP (such as evaluation of effectiveness). However, since the commenters did not provide specific examples, EPA cannot provide a response.

One commenter recommended a multi-objective decision analysis, which is a benefit analysis tool. Although such a tool can be informative, it was not used at the Site and is not required to be used by CERCLA or the NCP. For this Site, data gathered for the remedial investigation and by other parties was used to evaluate the distribution of COCs in sediment, surface water, and upland media in order to identify the areas where remediation is necessary. Additional monitoring will be conducted prior to designing the remedy in order to incorporate changes in site conditions and will allow flexibility in the design.

Regarding comment on an optimized remedy for Swan Island Lagoon and accounting for risk reduction associated with ENR, the back portion of Swan Island Lagoon was assigned a no SDU technology assignment under Alternative I; therefore, the remediation foot print did not extend to the back portion of the lagoon. The proposed plan did not quantify risk reduction at Swan Island Lagoon due to ENR. This underestimate of risk reduction will be balanced in the ROD discussion with the addition of a higher end risk reduction estimate from ENR, along with a low end estimate to bracket the likely risk reduction outcome of ENR. During the remedial design for Swan Island Lagoon, site-specific factors and risk reduction due to ENR will be further assessed. BEHP exceeds its cleanup level around RM 8 and 9.5. The remedial design for the property will use pre-design monitoring data and flexibility to ensure the appropriate remediation technology is used to achieve protectiveness.

With regards to EPA fully evaluating the cost and cleanup benefit of the alternatives, EPA has included a discussion and presentation of cost-benefit of the alternatives in the ROD Part II, conditional simulation was used to evaluate SWAC uncertainty. The method is further described in Section 2.2.2 of the feasibility study report. Appendix I of the report includes a discussion of the analysis.

EPA did not evaluate PTW treatment and application of activated carbon equally because EPA is not requiring all PTW be treated in-situ. For example, PTW that cannot be reliably contained will be removed through dredging or excavation.

With regards to assertions that the statistical methods used to evaluate alternative effectiveness are unclear and technically suspect or flawed, conditional simulation was the statistical analysis used to

evaluate SWAC uncertainty and is described in Section 2.2.2 of the feasibility study report. Appendix I of the feasibility study report also includes a discussion of the analysis.

In response to the comment that EPA should evaluate sustainability of the alternatives, the CERCLA statute and the NCP set out the requirements for selecting CERCLA remedies at Superfund sites and evaluating sustainability specifically is not provided for in the regulation.

2.10 Data Issues

2.10.1 Use Newer Data to Design the Remedy

Comment Summary

A total of 192 comments were received that stated that EPA was using data that were too old. A little more than half were received in the form of a multi-comment postcard that said:

- "(The plan) relies on data that is more than 10 years old."

The remaining comments were personal comments and echoed that concern. Many also stated that they believed the river was recovering naturally and that additional data should be collected before cleanup decisions were made.

Representative personal comments include:

- "I'm skeptical about a plan that is based on 10 year old data. Things have changed in the last 10 years!"
- "I know making a plan can take time but in 12 years a river can change a lot and with the newer laws restricting what' goes into the river the river has had a chance to clean itself naturally. If there is updated data I would urge you to look at that and consider a less extreme and costly plan."
- "EPA's plan is based on old information. Since their original data were collected in 2004, studies show that the contaminate levels in the Willamette River have actually improved. This restoration was done naturally…"
- "I find it stunning that the plan to clean up Portland Harbor relies entirely on data from eight and twelve years ago while ignoring data from only two years ago. The more recent data shows that almost half of the contaminants that were in the water have already been eliminated by letting nature run its course."
- "(EPA) could have been completing tests over this time frame and seen that things are changing for the better, but they haven't. Why is that? It's imperative that all options are considered before moving forward with EPA's unnecessary and expensive proposal to clean the river."
- "This plan is based on old data that EPA collected in 2004 and 2008. In 2014, experts studying the Willamette River found that the river is recovering. Through natural restoration, there has already been a 40 percent reduction of contamination in the water. EPA has entirely ignored this data to focus on a drastic plan that would make the river inaccessible for years."

- "I think it's good to be skeptical of an EPA plan that utilizes date from 2004. That's twelve years ago. The river is constantly moving and changing. Current studies have determined there to be a minimum of a forty-percent reduction in the contamination levels in the river since 2004, and we should not disregard the findings. Why dig up a river and possibly create more contamination if it's taking care of itself? Maybe things have settled, maybe there is contamination that has cleared up through natural means, but things have certainly changed for the better and disrupting that process will create problems."

EPA Response

The Portland Harbor remedial investigation report (USEPA 2016a), feasibility study report (USEPA 2016b), and June 2016 proposed plan (USEPA 2016c) were based on an extensive site characterization that included thousands of surface and subsurface sediment samples, hundreds of pore water and surface water samples, and multiple rounds of biota sampling and physical sampling activities, including sediment profile imaging and bathymetric and side scan sonar surveys. Four rounds of sampling targeting a range of media were performed by LWG between 2001 and 2008. Additional sampling utilized to support EPA's proposed cleanup were collected by individual parties between 1997 and 2011, including additional sediment data collected between 2008 and 2011. Finally, tissue sampling that focused on individual smallmouth bass and PCBs was performed in 2007, 2011, and 2012.

EPA utilized the 2007-2012 smallmouth bass fish tissue samples to evaluate declines in fish tissue concentrations associated with natural recovery. Based on the results of this analysis, presented in Section 3.6.1.3 of the feasibility study report, EPA concluded that the sample size, limited number of time points, and inconsistency in sampling methodology preclude a meaningful, statistically valid determination of a trend in fish tissue concentrations. The 2007 and 2012 fish tissue data may serve as a baseline for future evaluations of fish tissue PCB concentrations; however, baseline fish tissue data for other bioaccumulative contaminants will need to be established through the remedial design process.

EPA acknowledges that the majority of site-specific data were collected prior to 2008. However, EPA believes that the data are sufficient to accurately characterize the nature and extent of contamination, assess risks to human health and the environment, evaluate remedial action alternatives in the feasibility study, and serve as the basis for selecting a remedy for the Site. Also, see response in Section 2.10.2. for further response on newer data.

Any uncertainties in the data or changes in site conditions will be addressed through focused remedial design sampling activities at the Site. Remedial design sampling data will be used relative to the decision tree in the ROD to refine the footprint of areas that will be targeted for capping, enhanced natural recovery, and in-situ treatment and to refine the volume of material that will be targeted for removal through dredging and excavation. In addition, long-term monitoring will be performed to monitor the effectiveness of the remedy to achieve the remedial action objectives established for the Site. Data on contaminant levels in all media will be used for multiple purposes such as to determine if natural recovery is taking place as expected or if any additional actions are required to achieve the cleanup goals on the planned timeline, track if fish tissue concentrations are decreasing, and monitor if the caps are effectively containing the contaminated sediment and/or groundwater. Data on contaminant levels in fish tissue will also help inform when and how the fish consumption advisory or other restrictions could be relaxed.

2.10.2 Evaluate Potential Changes Raised by New Data

Comment Summary

A number of commenters stated that the feasibility study report and proposed plan fail to consider recent data collected between 2012 and 2014 in the evaluation of remedial action alternatives. Specific data sets that were referenced include the 2012 fish tissue sampling conducted by the Lower Willamette Group, the 2013 benthic health study by Germano & Associates, the 2014 sediment sampling conducted by Kleinfelder (Kleinfelder 2015) on behalf of a subset of Portland Harbor PRPs, and the 2014 sediment sampling conducted by GeoSyntec within Swan Island Lagoon. The commenters stated that these data demonstrate that natural recovery is occurring at the Site.

For example, it was noted that the sediment data collected by Kleinfelder indicate that the actual site-wide PCB SWAC is approximately 20 percent of the value used by EPA in the final feasibility study report and less than 50 percent of the value in the LWG 2012 draft feasibility study report and risk assessments. It was also noted that these new data generally confirmed EPA's PCB background level of the Site of 9 µg/kg but also indicated that a statistically significant reduction in the concentrations of PCBs in the river had occurred, consistent with the Lower Willamette Group's 2012 fish tissue results.

Similarly, it was noted that the data collected by GeoSyntec within Swan Island Lagoon show that PCB concentrations in the Swan Island SDU are mostly lower than what was used in the feasibility study report and that 75 percent of new samples showed reduced PCB sediment concentrations. One commenter stated that the public is not well served if EPA ignores this recently collected data.

The 2015 and 2016 NewFields reports stated that the PAHs in the vicinity of the former ExxonMobil Terminal are pyrogenic in nature and can be attributed to operations at the former Gasco property. The commenter believes that this new information should have been acknowledged in the feasibility study report.

One commenter stated that, collectively, the recent data demonstrate that the concentrations of contaminants in surface sediments have decreased significantly, and the concentrations of PCBs in fish tissue have declined since the original data collection. The commenter stated that these findings are not irrelevant when making decisions that are supposed to be based on science and should be considered in the selection of a remedy to reduce risk. Other commenters stated that EPA based its analysis on older data that no longer represent site conditions and disregarded more recent data, resulting in an alternatives analysis that is inappropriate and flawed.

Some commenters state that these data should be used to reassess key portions of the analysis, including revision of the RALs utilized to develop the remedial alternatives. The comment stated that when surface weighted average concentrations based on the newly collected data are used, EPA's knee of the curve analysis shifts away from Alternatives F and G toward Alternatives B and D. It was further noted that as the Site recovers before construction, the same RALs will delineate ever smaller areas of active construction. Failure to recognize these ongoing processes will cause errors in the selection of the most cost-effective remedy.

Some commenters also stated that the newly collected data demonstrate that the ROD should be sufficiently flexible to allow this additional information to be incorporated into the remedy and that EPA's remedy should describe what site-specific remedy adjustments will be allowed in the remedial design phase and how those adjustments would be determined and what procedural steps would be needed (such as explanation of significant differences or ROD amendment).

One commenter believes the composite subsurface sediment data are not representative and should not be used to estimate dredge volumes.

EPA Response

As described in Section 1.3 of the feasibility study report (USEPA 2016b), the feasibility study data set included data collected under EPA oversight through authority of the Portland Harbor and Gasco and Arkema AOCs.

The feasibility study report used sediment data collected as recently as 2013, and presents and discusses contaminant concentration trends in fish using the data collected by LWG as recently as 2012. Thus, the assertion that data are a minimum of 9 years old is incorrect. As noted in the 2012 draft feasibility study report (LWG 2012), the large data set is considered adequate to represent current conditions and for evaluating alternatives in the feasibility study report (USEPA 2016b). Additional sampling to more fully assess "current conditions" is a remedial design issue and beyond the scope of the 2016 feasibility study report.

EPA evaluated and incorporated the smallmouth bass tissue data collected in 2012 in the 2016 feasibility study report. The results of this analysis are presented in Section 3.6.1.3 of that report. The evaluation focused on fish tissue data collected in 2007 and again in 2011/12; PCB tissue data for smallmouth bass collected in 2002 are not directly comparable with the data because individual fish collected in 2002 were composited by river mile without regard to side of the river prior to analysis. In 2007, fish were composited by river mile but segregated by side of the river prior to analysis, whereas fish collected in 2011/2012 were analyzed individually. The results of the analysis showed that in all but two instances (RMs 4E and 7E), concentration declines were not statistically distinguishable from zero. Possible explanations are the trend itself is close to zero, or the estimated coefficient could be very different from zero with a very wide confidence interval. The former would imply that the decay rate is small and that it is simply close to zero with strong level of confidence, whereas the latter indicates that the data are too sparse to precisely estimate the decay rate. As discussed in the response to LWG Dispute Issue 2c (Appendix A of this document), the sampling events are not sufficient to establish a reliable trend.

In general, a decision-making process cannot undergo constant modification when data are collected at various times and locations throughout the Site. There has been no new information that indicates that the nature and extent of contamination at the Site is significantly different than the remedial investigation/feasibility study data set indicates. Further, data presented in the 2015 Kleinfelder report do not on their face appear comparable to previously collected remedial investigation data (10cm surface samples vs the 30cm samples collected in the remedial investigation), making the conclusions therein regarding trends questionable. However, some conclusions provided in the August 7, 2015 memo to Jim Woolford and Cami Grandinetti are reasonable and consistent with the Agency's position, specifically that natural recovery is occurring in the Willamette and is anticipated to continue and that the food web model is a useful line of evidence for representing sediment and food web contaminant relationships. However, EPA expects remedial footprints to be refined based on data collected during remedial design. For example, if sediment concentrations have declined through natural recovery, pre-design sampling should result in a smaller remedial footprint.

EPA acknowledges benthic recovery is taking place; however, benthic risk was not one of the main lines of evidence used to assess alternatives. While it may indicate that natural recovery is occurring, benthic risk was not used specifically in the evaluation of different alternatives. EPA concurs that natural recovery is occurring within Portland Harbor and that it should be utilized in the sediment remedies, as

evidenced by the fact that MNR represents the response action assigned to between 64 and 90 percent of the total area of the Site for all alternatives carried through the detailed analysis in the 2016 feasibility study report. However, the rate of natural recovery is expected to vary by location. It is important to have a representative data set that establishes "baseline conditions" prior to initiating the cleanup. Pre-design sampling will be used to ensure that the natural recovery is factored into the design and implementation of the sediment remedy and post construction monitoring will be used to evaluate natural recovery following remedy implementation. See also Sections 2.7.2 and 2.7.3 of this responsiveness summary.

Additional data will be collected during remedial design to assist in refining the remedy beyond the feasibility study level of analysis. EPA intends to evaluate additional data during remedial design to refine the delineation of contamination, selection and design of remedial technologies, and construction methods.

2.10.3 Explain Use of Non-Detects

Comment Summary

Comments received from Legacy Site Services state the proposed plan inappropriately uses elevated detection limits to calculate RALs and PTW footprints, which unnecessarily inflate the areas and volumes required for remediation and disposal to achieve risk goals. Legacy Site Services also stated that EPA should remove sample locations with PCB non-detect values with elevated reporting limits (e.g., > 1 milligram per kilogram) from the PCB footprint analysis as these bias and exaggerate the area of PCBs in sediment adjacent to the Arkema site. They further assert that RAL footprints should only consider detected PCBs based on PCB congener concentrations adjacent to the Arkema site, due to matrix interference with DDx in PCB Aroclor analyses. The commenter also requested that additional PCB congener data be collected from areas of non-detect sample locations with elevated reporting limits to confirm if PCB concentrations are present at these locations.

EPA Response

EPA used the data provided by LWG, including the commenter. LWG did not indicate that there were any issues with the data nor did they remove the data from the database provided to EPA. If there were issues with the data, LWG should have flagged the data and resampled using congener analysis. EPA agrees that congener, not Aroclor, data should be collected at this Site in remedial design. Review of the footprints shown in the feasibility study report (USEPA 2016b) for PCB RAL contours (Figure 3.4-7), DDx RAL contours (Figure 3.4-12), and dioxin/furan RAL contours (Figures 3.4-8, 3.4-9, and 3.4-10) indicates that the SMA footprint offshore of the Arkema property is largely driven by DDx and dioxins/furans and overlaps with the PCB RAL footprint; thus, omitting PCB data from this area would not substantially change the evaluation in the feasibility study report. New data will be collected in remedial design that will determine the SMA boundaries based on the final RALs selected in the ROD.

2.11 Modeling Issues

2.11.1 Explain Why the Mechanistic Food Web Model Is Appropriate

Comment Summary

Several commenters questioned the use of the mechanistic food web model to develop PRGs and highly toxic PTW thresholds. Three comments stated that, because the food web model was calibrated using data from both the near shore areas (where contaminant levels are higher) and the navigation channel (where contaminant levels are lower), it is inappropriate to use the food web model to develop PRGs

that are applied to nearshore SDUs. It was noted that the food web model assumes that all fish are exposed to the bank-to-bank, Site-wide average sediment concentration of a contaminant (i.e., the average across the near-shore areas and the navigation channel throughout the study area) but, as determined in a radio-tagging study performed in the Lower Willamette River, fish are more likely to feed in near-shore areas that contain higher contaminant sediment concentrations. Based on this information, the commenters concluded that the approach used by EPA overestimates COC bioaccumulation and subsequently results in sediment PRGs that are biased low and thus overly conservative sediment.

One commenter stated that, because of this bias, the bioaccumulation based PRGs should be applied on a Site-wide or full river mile basis. One commenter provided additional analysis showing that the SWACs estimated for RM 2 – 3 (full river mile) are lower than the SWACs estimated for SDU 2E for all alternatives and that the Alternative B SWAC for RM 2 – 3 of 32.5 µg/kg is slightly lower than the Alternative E SWAC for SDU 2E of 37.2 µg/kg.

It was also noted that there is a high degree of uncertainty associated with the development of tissue-sediment relationships and that because the food web model is used to derive sediment PRGs as well as to model fish tissue concentrations for estimating post-construction and residual risks, those uncertainties are carried throughout the remedial alternatives assessment. It was further noted that this degree of uncertainty is greater than the difference in post construction risk between alternatives.

One commenter provided a detailed critique of the food web model and concluded that the food web models have not been shown to accurately predict post remediation tissue concentrations and thus are not appropriate for setting sediment based remedial cleanup levels. The commenter also specifically noted that for Portland Harbor, the food web model was not run in a manner that would be able to predict post remediation concentrations, the model was not fully tested, and the calibration and validation approach provides no evidence the model can predict post remediation tissue concentrations.

The commenter also stated that fish collected at the Site have fish tissue concentrations consistent with non-urban stretches of larger Northwest rivers, and sediment remediation is unlikely to reduce fish tissue concentrations over much of the Site and will not result in the targeted tissue concentrations. The commenter recommended the identification of sources of PCB other than those released within the Portland Harbor, determine the relative contribution of all sources to the aqueous phase, model areas of the Site with different sediment concentrations separately, test the assumptions that the results are predictive at low sediment concentrations, use measured, not modeled pore water partitioning coefficients and acknowledge the uncertainty in the food web model.

Similarly, LSS commented that the conceptual site model does not adequately explain the relationship between surface water quality and tissue concentration and instead relies solely on sediment concentration which only explains about one third of the variation of DDx in fish tissue. As a result, they state sediment remediation will not achieve the desired tissue-related outcomes.

One commenter stated that the food web model was inappropriately applied to develop a PTW concentration threshold for total PCBs, and flaws within the food web model have resulted in calculation of a low-biased PTW concentration threshold. The commenter noted that the food web model is not sufficiently robust enough to develop sediment PRGs based on the fish consumption exposure pathway. As a result, the commenter undertook a more comprehensive review and re-evaluation of the food web model and included the results in a report. The commenter stated that because their model was calibrated more robustly, (1 million iterations vs. 9,982 iterations), it produced a calibrated model for

both Total PCBs and Total DDx that more accurately predicts measured average fish tissue concentrations and thus compels EPA to reconsider its use of the remedial investigation Mechanistic Model to derive the PCB PTW concentration threshold. The commenter noted that application of this model to define the PTW threshold would result in a highly-toxic PTW threshold of 500 µg/kg based on average fish tissue concentrations associated with a 1 x 10^{-3} cancer risk to subsistence fishers exclusively consuming fish caught in Portland Harbor (i.e., EPA's definition of the PTW sediment concentration threshold) rather than the 200 µg/kg presented in the feasibility study report and proposed plan.

EPA Response

The food web model used to develop the PRGs was created by LWG to develop a predictive relationship between chemical concentrations in sediment, water, and tissue that can be used to derive PRGs for RAOs 2 and 6. EPA notes that the food web model was appropriately developed, parametrized, calibrated and applied to develop risk-based PRGs associated with RAOs 2 and 6 and, by extrapolation, PTW thresholds. EPA approved the model approach developed by LWG and determined the model could be used for decision-making at the Site. For more detail regarding the use of the food web model to develop PRGs, see Response to LWG Dispute Issue 1l (Appendix A of this document).

Regarding surface water concentrations, Section B1.3.3.1 of Appendix B of the feasibility study report (USEPA 2016b) describes the use of surface water concentrations in the food web model. Chemical concentrations in the water column were calculated using XAD water column samples collected during the seven sampling events at five transect locations and are presented in Tables B1-12a and B1-12b of Appendix B.

EPA acknowledges the uncertainty in the food web model but notes that many of the PRGs developed for preliminary sediment cleanup goals for contaminants found in fish tissue presenting unacceptable risk are based on background concentrations. The remedy will be evaluated through a robust monitoring program that will also include fish tissue monitoring. For example, PCBs are the COC with the greatest area of sediment contamination exceeding the PRG. Because risk-based PRGs resulting from the food web model are well below background, the sediment PRG for PCBs was developed based on an analysis of PCB sediment concentrations in the background data set, not on food web model relationships. Further, the remedial approach in the ROD is to address higher concentration areas and then allow MNR to achieve cleanup levels. RAL footprints represent the areas over which active remediation will be conducted and are a risk management tool used to target the most heavily contaminated sediments. Thus, areas of the sediment exceeding the RAL (not all areas that exceed the cleanup level) are targeted for remediation. In this regard, the uncertainty associated with the food web model does not markedly influence the alternative analysis or remedy selection because footprints are designated by RALs and PRGs were developed independent of the food web model. Overall, the combined uncertainty associated with each analysis and decision point is managed through a robust post-remediation monitoring program that ensures that fish tissue contaminant concentrations (and hence human health risk) are known post remediation so that identified risk, if any, can be managed through the five-year review process.

EPA disagrees with some of the statements. For example, one commenter noted that the food web model was not robustly calibrated. However, as described in the Bioaccumulation Modeling Report (Windward 2015), model calibration was performed through probabilistic analysis against contaminant data from multiple species collected throughout the Site (the calibration data set is described in Windward [2009],

Appendix F). Total PCBs was selected for initial calibration and run 50,000 times using Monte Carlo simulation (performed using Crystal Ball® software) with different combinations of plausible values for all calibrated, non-chemical-specific model input parameters and the best performing model run identified.

EPA also disagrees with statements that the food web model cannot be applied on smaller spatial scales. As described in the bioaccumulation modeling report, the food web model was applied on a study area-wide basis for calibration. However, the modeling effort also evaluated the model's ability to predict smallmouth bass and sculpin tissue concentrations on a smaller spatial scale for total PCBs. The same top performing model run was identified using the Site-wide and smaller-spatial-scale model runs thus demonstrating the models ability to perform on both the site-wide scale and smaller spatial scale. Based on this evaluation, it was concluded that model is predicting well on a smaller spatial scale for smallmouth bass and sculpin, which have home ranges that are less than site-wide. EPA hopes to further refine species home ranges, but what has been developed is sufficient to support the need to take action, and minimize reliance on MNR.

PCBs have been detected in smallmouth bass collected at the Site at concentrations that exceed the range of background levels presented in the comment, and multiple locations of PCB sediment contamination have been identified at the Site. EPA acknowledges that fish tissue samples collected outside Portland Harbor also contain PCBs. Similar to the Site, upstream areas with elevated PCB concentrations, such as RM 16, also have fish with elevated PCB concentrations. In addition, areas within the Site that have relatively low fish tissue PCB concentrations typically exhibit low sediment bed concentrations.

EPA disagrees that the risk goals established for the Site cannot be met. The analysis presented in the feasibility study report indicates that remediation of PCB-contaminated sediment is expected to reduce the concentration of PCBs in fish tissue. Additional efforts to eliminate sources of PCBs in the downtown reach and upriver are further expected to reduce PCB fish tissue levels. As is noted above, remedy performance will be evaluated through a robust monitoring program that will include fish tissue monitoring. The results of this monitoring effort will be used, in part, to determine whether additional sources of PCBs are present within the system that may limit the effectiveness of the remedy.

Regarding the model submitted in support of comments that support development of a 500 µg/kg PTW threshold, EPA notes that the food web model was appropriately developed, parametrized, calibrated and applied to develop risk-based PRGs associated with RAOs 2 and 6 and, by extrapolation, PTW thresholds. The commenter has not provided sufficient information to demonstrate that the proposed PTW threshold for PCBs of 500 µg/kg is more accurate than the current PTW threshold of 200 µg/kg. The use of 200 µg/kg as a PTW threshold was developed using a properly calibrated food web model and represents a 1×10^{-3} risk level for identifying PTW that is highly toxic, consistent with EPA guidance on identifying principal threat and low level threat wastes.

2.12 Conceptual Site Model

2.12.1 Conceptual Site Model Does Not Adequately Characterize the Site

Comment Summary

Comments regarding the CSM were submitted by several parties, including the PCI Group, USACE, EVRAZ Inc., LSS, LWG, RM 11E Group, Exxon Mobil, and Union Pacific Railroad. Several of the commenters (the PCI Group, EVRAZ Inc., LSS, LWG, RM 11E Group, ExxonMobil, and UP Union Pacific Railroad) indicated that the CSM presented in the feasibility study report (USEPA 2016b) (Figure 1.2-

26) does not adequately characterize actual site conditions and the complexity of the Site and identified one or more elements of the CSM that should be added or improved, including:

- Effects of background conditions; the importance of non-steady state conditions
- Critical role of spatial complexity associated with sedimentary parameters such as grain size and organic carbon
- Site uses
- Biological habitats
- Potential habitat restoration sites
- Biological receptors in sediment and surface water
- Biogeochemical recovery pathways; how humans access and use the river for navigation and recreation
- Chemical distributions in subsurface sediments
- Contaminant sources including upstream chemical inputs to surface water
- Extent of highly mobile sediment
- Recent analytical data

Commenters (PCI Group, LSS, ExxonMobil, EVRAZ Inc., and Union Pacific Railroad) said that a predictive quantitative model (e.g., hydrodynamic and sediment transport model) is needed to make cleanup decisions and select alternatives. Exxon Mobil also stated that a site-specific fate and transport model is needed for evaluating remedy effectiveness and the benefits of remedial methods. Comments also stated that EPA's CSM was not developed in accordance with EPA and other applicable guidance. Because of these deficiencies, commenters stated that the CSM cannot be used to support the development and evaluation of the alternatives identified in the proposed plan. USACE also stated that the CSM should be modified regarding assumed exposure scenarios associated with aquatic disposal of dredged material. LSS commented that because the CSM fails to address background water quality and contaminant sources (e.g., mercury in fish tissue), there will still be fish advisories for contaminants not related to Site COCs.

EPA Response

EPA disagrees with the assertion that the CSM is inadequate and cannot be used to support alternatives evaluations. The CSM, as documented in Section 10 of the remedial investigation report (USEPA 2016a) was developed in accordance with EPA guidance, *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (1988) and *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (2005). The CSM presented in Figure 10.1-1 of the remedial investigation report (USEPA 2016a) and Figure 1.2-26 of the feasibility study report (USEPA 2016b), provides a visual summary of the environmental system, contaminant sources, affected media, fate and transport processes, and human and environmental receptors. The remedial investigation report further describes each of these elements in detail. The CSM and the information presented in the remedial investigation report re based on a robust data set collected by LWG under EPA oversight.

Commenters contend that the CSM incorrectly assumes that surface sediment and surface water concentrations across the Site exist at steady state. The CSM in the remedial investigation report describes the lower Willamette River as a dynamic river system (see Portland Harbor remedial investigation report (USEPA 2016a), Sections 3 and 10) (USEPA 2016a). EPA's assumption was that the Site is in dynamic equilibrium, not steady state. See LSS Dispute Issue 1 (Appendix A of this document).

Several commenters contend that the CSM needs to be represented by a predictive quantitative model that incorporates site conditions, contaminant distribution, and multiple fate and transport processes. Quantitative models have been developed for the Portland Harbor Site but they have not been found to effectively represent the CSM. As described in Section 4.1.2 of the 2016 feasibility study report, a hydrodynamic and sediment transport model was developed by LWG and presented in the draft feasibility study report (LWG 2012). EPA commissioned external expert reviews of this model, which identified several shortcomings that limit its usefulness in predicting sediment transport within the Site (see Appendix H of the 2016 feasibility study report). EPA reviewed the predictability of the 2012 draft feasibility study report QEA Fate Model and found its predictability poor. EPA also did not use the SEDCAM sediment recontamination model as it only predicts deposition, not erosion, and is thus inconsistent with the CSM. EPA concluded that existing empirical data and information about the Site and contamination was sufficient for remedy decision-making given the lack of sufficient data to adequately populate a model that could simulate conditions on such a complex system. See EPA's position response to LWG requested relief 2 and LWG Dispute Issues 2a and 2b (Appendix A of this document).

Even LWG acknowledged the lack of data necessary to develop such a model, and that any model developed would have great uncertainty in predicting the outcomes of any alternative developed for the Site See EPA's position in response to LWG Dispute Issue 2a) (Appendix A of this document). EPA believes that the CSM along with all of the information contained in the remedial investigation report and information used in the 2016 feasibility study report (USEPA 2016b) are sufficient under CERCLA, the NCP and EPA guidance to develop and select a remedial alternative.

The activity-specific human health and ecological risk assessment CSMs suggested by USACE can be beneficial but, as suggested by USACE, EPA does see the value in developing activity-specific human health and ecological risk assessment CSMs and will consider use of this approach during remedial design. Following the collection of additional data during remedial design, exposure scenario assumptions will be reevaluated as needed. For additional information regarding EPA's position on this issue, please see EPA's response to Union Pacific Railroad's Dispute Issue 5, LSS's Dispute Issues 1, 5, and 20, and LWG's Dispute Issues 2a and 2b (Appendix A of this document).

2.12.2 The CSM Does Not Properly Consider MNR

Comment Summary

EPA received several comments regarding the evaluation of MNR at the Portland Harbor Site. Comments included statements that the Site was lacking a CSM that properly considered MNR; some of the data used in the feasibility study evaluations was outdated and more recent data including fish tissue and sediment sampling results were not properly incorporated into the MNR evaluation; the use of interim cleanup targets was inappropriate; and a quantitative evaluation of MNR was not conducted as part of a multiple lines of evidence evaluation.

One commenter stated that multiple lines of evidence, including time series bathymetry data, the fine-grained nature of the majority of Site surface sediments, surface to subsurface sediment contaminant

concentration ratios, and detailed sediment transport modeling, all indicate that the majority of the Site surface is a depositional system. The commenter stated that empirical bathymetric data indicate 63 percent of the Site is depositional and an additional 25 percent of the Site is stable (no substantial bed elevation change). Thus, approximately 88 percent of the Site is stable or depositional. This is an important element that should be explicitly operationalized because natural recovery represents one of the important core processes in the site CSM.

Another commenter disagreed with statements by EPA that "sediment trend data do not exist for this Site; insufficient biota and water trend data exist" and "the hydrodynamic and sediment transport model predictions are inconsistent with the CSM for this Site." The commenter stated that a significant amount of information collected during the remedial investigation demonstrates that river conditions have changed over time. For example, EPA's RJ found that, "Concentrations of total PCBs, DDx, total PAHs, hexachlorobenzene, total chlordanes, aldrin and dieldrin, gamma-HCH, lead, and TBT are higher in subsurface than in surface sediments, indicating that historical inputs were likely greater than current inputs."

EPA Response

EPA disagrees with the commenters that MNR was not considered in the CSM for the Site. The final remedial investigation report (USEPA 2016a) included a comprehensive CSM that considered sediment dynamics (Section 10.1.1), including evaluation of sediment trap data and sediment deposition rates developed based on bathymetric change data. In addition, the feasibility study included a multiple lines of evidence evaluation of MNR. Section 3.6.1 of the feasibility study report (USEPA 2016b) presents a summary of the lines of evidence considered during the evaluation of MNR. These include incoming sediment particle concentrations, sediment deposition rate, and fish tissue concentration trends. Other factors that were considered are described in Appendix C of the feasibility study report and include the ratio of subsurface to surface sediment concentrations, wind and vessel wake-generated waves, predicted bottom shear in comparison to critical shear stress and propeller wash. These multiple lines of evidence indicate that the majority of the Site surface is amendable to MNR. See Section 2.16 of this responsiveness summary for additional information related to hydrodynamic sediment transport modeling and other MNR issues.

2.13 Cleanup Technologies – Capping and Dredging

2.13.1 Capping Is Not an Appropriate Technology

Comment Summary

Eleven personal comments expressed concerns with capping, either as a cleanup technology altogether or related to how the caps would be designed (e.g., use of concrete on river banks). One comment noted that EPA itself believed it was inappropriate at megasites, and several people said that capping was only temporary and that contamination would eventually be released.

Representative comments include:

- "Alternative I can best be described as a system engineered to release our harbor's non-degradable contaminants into the environment at a rate that stays within pollution-control standards. For example, it calls for "capping" more severely contaminated areas of the harbor floor with clay. We can expect harmful contaminants to continue leeching from these areas, but more slowly. Caps are, in effect, time-release mechanisms, delivering a lower dose of contaminants to our environment over a longer period of time. The long-term effect is that all the

non-degradable contaminants will ultimately diffuse into the environment, and into the food web."

- "Capping is not restoring natural habitat. Portland needs and deserves a clean river, not a concrete ditch. The river must be clean and safe for fish, birds, and other wildlife. Restore a natural river bank, not a lot of concrete and capping."
- "In EPA's recommendations and advocacy for capping, they state that it is inappropriate at "industrial megasites" [iii] With ten miles of industrial waste, the Portland Harbor certainly meets the definition. Why New Technologies. Collecting, learning from, and incorporating new information into practice is the only avenue to improving the effectiveness of remedial operations. Regardless of cost or controversy, achieving the expected effect of remedial actions—improvements in the environment—is of primary importance."
- "I am not very comfortable with the capping plans, I don't feel like the river bottom is a secure place, that can be just kind of once you cover something there that it's gone, I feel like that's not really cleaning up the mess. I'm less concerned about who's a responsible party than I am about getting the poison out of the river so that it doesn't affect animals and people and, you know, future generations all the way down to the ocean."
- "Capping is just leave contaminants in place to be released by disturbance later. Ships aren't getting smaller - someone will want to dredge a deeper channel into the harbor eventually. The only way to prevent recontamination by capped sediments is to physically remove all contamination now, to a secure off site location (one where it will not recontaminate its new location)."

EPA Response

EPA recognizes containment as an effective way to isolate or immobilize contaminated sediment through capping technologies under the right conditions and in specific locations. The mechanics, effectiveness and implementability of various capping technologies are discussed further in Section 2.3.5 and Table 2.4-2 of the feasibility study report (USEPA 2016b).

None of the caps being recommended at the Portland Harbor Site utilize concrete in their design. The suggested cap designs include both passive and active (reactive) caps designed to physically isolate and sequester contaminants for extremely long design periods. Reactive caps such as those containing activated carbon do not just provide a physical isolation layer between the contaminated sediments and the water column, but also actively bind the contaminants to their surfaces, lowering their availability to organisms the cleanup seeks to protect. That is why these are termed active caps and this binding to the reactive amendment is usually irreversible under normal environmental conditions. Cap designs will account for more frequent flooding likely with climate change, as well as other considerations such as vessel wakes and prop scour.

All caps require long-term maintenance, thus issues such as disturbance due to navigation would be monitored and remedied as necessary, the details of which would be included in a long-term monitoring plan. Consistent with Clean Water Act § 404(b)(1) guidelines, where the remedial action adversely impacts habitat, the cap will be designed to minimize the impacts and restore the surface for habitat function, and if loss of habitat occurs, compensatory mitigation will be undertaken. The details of any necessary mitigation to protect habitat would be developed during remedial design. For example, the feasibility study assumed equivalent cap thickness is dredged prior to placement to allow for a net zero

bathymetry change thereby limiting the need for mitigation. The ROD provides a remedial technology decision tree and design considerations for proper planning and applicable conditions under which capping technologies can be considered for the remedy.

2.13.2 Dredging Should Be Minimized

Comment Summary

Comments were received from Calbag Metals Co. and LWG that cited evidence suggesting that fish tissue PCB concentrations will temporarily increase for a period of years during and following dredging. Their concern was that this was not evaluated in the comparison of alternatives. LWG also criticized the use of zero as a replacement value for dredge areas after construction was completed.

Calbag Metals Co., the City of Portland, LWG, and Siltronic Corporation all commented on the need for evaluation of short-term impacts of dredging during and right after construction. The impacts cited included negative effects on shipping schedules within the harbor, ships leaving the harbor, potential damage to the ecological community at the bottom of the river, increased diesel emissions due to transportation of sediment to and from the Site, noise impacts to the local communities, and potential increase in contaminant concentrations in fish tissue for short periods of time. LWG also believed that no new quantitative evaluations for dredge release and residuals have been conducted, and both LWG and Siltronic commented on the use of only one study (Hudson River) on dredge releases and the limited selection of dredging BMPs.

According to The Marine Group BAE, EPA's assessment of river bank excavation was also deemed overly general and technically impractical, and the use of in-place technologies was suggested instead.

EPA Response

EPA's 2005 Sediment Remediation Guidance, Section 6.5.5 "*Predicting and Minimizing Sediment Resuspension and Contaminant Release and Transport During Dredging*" (USEPA 2005) states:

- "Some contaminant release and transport during dredging is inevitable and should be factored into the alternatives evaluation and planned for in the remedy design. Releases can be minimized by choice of dredging equipment, dredging less area, and/or using certain operational procedures (e.g., slowing the dredge clamshell descent just before impact with the sediment bed)."

The feasibility study report (USEPA 2016b) explicitly states that some contaminant release is inevitable in the alternative assembly and evaluation (Sections 3.4.8.5, 3.4.8.6, and 3.4.8.10). The discussion describes results from other recent and relevant dredge operations and focuses on technological and operational procedures for lessening release and resuspension as discussed further below.

Post-construction COC concentrations in areas assigned dredging or capping were assumed to be zero immediately after operations, as the 2016 feasibility study report assumed clean material would be used for caps, and that the residual layer applied to dredged areas for the purpose of addressing contaminated dredge residuals would consist of clean sand. Thus, potential increased effects on fish tissue concentrations were also assumed to diminish right after construction. The feasibility study report assumptions are supported by observations at the Grasse River Remedial Options Pilot study and the Hudson River Phase I dredging where fish tissue concentrations that spiked during operations (presumably related to contaminant releases) were generally not elevated above baseline after dredging ceased (the increased concentrations did not persist for "years" following construction). Importantly, it was also these projects that led to many of the lessons learned regarding engineering and operational

controls of sediment resuspension and contaminant release and the management of dredging residuals. EPA's response to LSS Dispute 8 (Appendix A of this document) also contains relevant information on this issue.

The feasibility study report release estimate emphasizes results from Phase 2 of the Hudson River dredging because it was a recent (2011-2015), large, multi-year dredge project, with site and operational characteristics similar to the dredging proposed in the feasibility study report (contaminated sediment removal in a large, riverine environment with multiple mechanical dredges using barge transport). Hudson River Phase 2 dredging operations incorporated lessons learned from Phase 1 dredging and recommendations from the Hudson River Peer Review Panel. Thus, the project represents state-of-the-art approaches for managing dredge releases while maintaining (or increasing) productivity. The peer review report states, "The repeated dredge passes and prolonged exposure of sediments in the certification units resulted in increased PCB resuspension and release." To minimize resuspension and release, the panel recommended to improve depth of contamination estimating procedures and to:

- "Establish BMPs to limit sediment resuspension and release.
- Perform confirmation sampling in each 1-acre sub- certification unit as soon as possible after attainment of the DoC Elevation in 95 percent or more of the area is confirmed by EPA.
- Place a 3 to 6-inch sand cover over sub- certification unit as soon as possible after confirmation samples are collected (before PCB analytical results are obtained).
- Use PCB analytical results of composited surface samples to determine whether an area will be backfilled or capped and install final layers accordingly."

Due to the Peer Review Report's recommendations, the feasibility study report also emphasizes BMPs to limit sediment resuspension and release and placement of residual sand cover of 12 inches to lessen short-term impacts and enhance the effectiveness of dredging and capping to achieve the final cleanup goals within a reasonable timeframe. EPA's final selected remedy incorporates these BMPs as requirements.

Regarding assessment of short-term impacts, EPA guidance states that short-term impacts should be identified and the trade-offs between alternatives discussed, and that is what EPA did in its feasibility study. The nature of the impacts is the same for all alternatives; the differences are magnitude and length of time with the increased construction with each alternative. Section 4.3.5 of the 2016 feasibility study report discusses the trade-offs for short-term effectiveness between alternatives. EPA states that the impacts for any alternative will be for 4 months per year and last the duration of the construction project. The Clean Water Act Section 404(B)(1) Evaluation found in Appendix L of the feasibility study report and the Programmatic Biological Assessment also discuss several other short-term impacts in detail. Additionally, the short-term impacts identified by the City of Portland have been discussed in Sections 2.17.4 and 2.20.1 of this responsiveness summary.

Furthermore, engineered rigid control measures were one of the BMPs considered to address dredge releases. Engineered rigid control measures were evaluated holistically in the 2016 feasibility study report for their use in reducing or eliminating short-term releases of contaminants during construction and not on a location-specific basis. Thus, the 2016 feasibility study report does not present figures indicating design level logistical details regarding location and depth of engineered rigid control measures. Sheet piles are a representative engineered rigid control measure identified and evaluated for

sediment dispersion control. However, that representative approach does not preclude other types of BMPs for consideration during remedial design. Details regarding sediment dispersion control and location-specific engineered rigid control measures will be determined during remedial design, which is the appropriate time for those types of evaluations.

The navigation channel and future maintenance dredge (FMD) areas were assigned dredging technology within SMAs. This approach is consistent with the LWG 2012 feasibility study report. Dredging is an essential part of achieving an effective remedy for the contaminated sediments at Portland Harbor. While the proposed plan (USEPA 2016c) indicates that exact depth of contamination is unknown at this stage, it also specifies that actual dredge depths will be established based on data collected during remedial design. If contamination in the navigation channel or FMD areas is too deep to be dredged, an isolation cap residing below the depth of navigation channel maintenance will be considered as appropriate. Detailed dredging volumes will be evaluated during the remedial design, and arbitrary depths will not be assigned as suggested by some commenters.

Currently, the contamination in the river banks is uncontrolled and either is migrating or has the potential to migrate to the river. There are tidal fluctuations twice daily, submerging portions of the river bank throughout the day, potentially exposing aquatic receptors to the river bank contamination. Furthermore, the river water levels rise and fall seasonally; thus, again submerging different portions of the river bank throughout the year. Other forces, sheet flow, gravity, or upland land uses, can lead to river bank soils eroding into the river. Therefore, river banks are appropriate to include in the cleanup plan. More details about existing conditions, contaminant concentrations, and design-level information will be obtained that will determine whether excavation of any particular river bank is required and, if so, how much and how the river bank will be restored, depending on reasonably anticipated future use, Endangered Species Act/404 requirements and long-term effectiveness considerations. See also EPA's response to LWG Dispute Issue 1q (Appendix A of this document).

EPA did evaluate all available technologies to specific areas in development of the alternatives and selected the appropriate technology to use based on site-specific environmental and anthropogenic conditions. However, the ROD decision tree demonstrates that there is flexibility in the technology assignments based on criteria to be evaluated during remedial design.

2.13.3 Use of Sheet Piles for Containment Was Not Properly Evaluated

Comment Summary

Thirteen comments were received expressing concerns with the use of sheet piles for containment during dredging of contaminated sediments. They are:

- It is inappropriate to use rigid containment for dredging sediment adjacent to Arkema. The proposed plan identifies that sheet piles are needed to address the large NAPL plume (incorrect assertion on plume size) offshore of the Arkema Site.
- There is no quantitative evidence of estimated dredge residuals or releases associated with dredging. EPA guidance recommends comprehensive evaluation of dredge impacts.
- Technical challenges exist due to site characteristics. Sheet piles will not contain the release of contaminants to surface water.

- EPA should explain when conditions may warrant changes to major alternative elements and when EPA may consider or allow the site-specific engineering evaluations.
- Site-specific evaluations determined that the use of sheet pile walls for containment during dredging would only be partially effective for containing releases. Sheet pile walls would impound contaminated water, which would be released when the walls were removed.
- Sheet pile walls are not water tight.
- Sheet pile containment would add significant cost, increase implementation risks, and increase construction duration.
- Sheet piles would mobilize NAPL to greater depths and to the sediment surface through smearing.
- Using sheet pile wall containment would pose a significant risk to worker health and safety.
- Scour around the perimeter of the sheet pile wall could cause structural failure and mobilize contaminated sediments.
- Sheet pile walls may not be sufficient, and a more expensive cofferdam-type system may be needed/evaluated.
- USACE will not allow sheet pile walls in the navigation channel.

EPA Response

The use of sheet piles was adequately evaluated relative to other control technologies and best management practices in the feasibility study report (USEPA 2016b). Sheet piles are a representative engineered rigid control measure identified and evaluated for sediment dispersion control in the 2016 feasibility study report. However, that representative approach does not preclude other types of rigid control measures for consideration during remedial design. Engineered rigid control measures were evaluated holistically within the 2016 feasibility study report for their use in reducing or eliminating short-term releases of contaminants during construction and not on a location-specific basis. Thus, the feasibility study report does not present figures indicating design level logistical details regarding location and depth of engineered rigid control measures. Location-specific evaluations for feasibility of sheet pile versus other types of engineered rigid control measures, including placement within the navigation channel, were beyond the scope of evaluation of the feasibility study report and will need to be evaluated during the remedial design. Details regarding sediment dispersion control, mitigating NAPL smearing, and location-specific engineered rigid control measures will be determined during remedial design, which is the appropriate time for those types of evaluations. Additionally, the remedial design will need to account for over-water structures, buried structures or debris, and geotechnical properties of the sediment bed.

The determination of technical feasibility of engineered rigid control measures is highly dependent on site-specific conditions. As stated in Appendix O of the 2016 feasibility study report, EPA agrees that depth can limit the use of suitable engineered options for controlling releases, and deep water depths can preclude the use of sheet piles. However, blanket elimination of the technology is not warranted given its effectiveness in reducing migration and dispersion of contaminated dredged material.

Remedial activities with the potential to restrict navigation in the harbor channel will be coordinated with the USACE and the Coast Guard during remedial design, including efforts to minimize sediment

dispersion in areas where NAPL extends into the navigation channel. The Rivers and Harbors Act prohibits obstructions to navigation, but CERCLA requires remedies to be protective of human health and the environment, and other federal statutes require measures to reduce impacts to Endangered Species Act species or the aquatic environment as well. No permanent obstructions will result from the cleanup, but some disruption to navigation may be needed to implement the remedy that will protect human health and the environment.

Risks to worker safety during construction will be addressed by the site-specific safety plan (Accident Prevention Plan). Responses related to the cost of sheet pile wall construction are included in Section 2.22 of this responsiveness summary.

2.14 Cleanup Technologies - Disposal

2.14.1 Do Not Use a Confined Disposal Facility

Comment Summary

A total of 1746 comments were received that expressed unhappiness with a CDF at Terminal 4. The vast majority (1313) were part of a form email or postcards, and included these statements:

- "EPA should eliminate the confined disposal facility which would create a permanent toxic waste dump in our river."
- "Toxic dredged sediments must be taken to an appropriate landfill. Creating a toxic waste disposal dump in our river is not acceptable."
- "Creating a toxic waste disposal dump in our river is not acceptable—toxic dredged sediments must be taken to an appropriate landfill."
- "Select disposal options that do not include a Confined Disposal Facility and that do include treatment of dredged sediment to breakdown or bind contaminants."

There were also hundreds of personal, individual comments which were all against the CDF. Representative examples of these comments include:

- "Thank you for your service to the community. Please pursue a cleanup alternative that adequately restores the endangered health of our river. Dredging must be removed from the vicinity and not stored in terminal 4."
- "Please listen to the task force that has watched this for a decade or more, and is in the best position to give technical advice on how many acres, what should be cleaned, where it should be dumped, and for Heaven sakes do not dump it back in the river someplace else. What a crazy idea."
- "Thank you for leading an effort to cleaning our river. Do not place dredging in the terminal 4 locations please. Terminal 4 provides sturgeon habitat and tremendous sustainable economic activity at the port."
- "The river should be dredged of the toxic waste to remove it from the Willamette and be taken to an appropriate landfill where it will not affect the livability of that area."

- "Take toxic dredged sediments to an appropriate landfill. Confined disposal facilities and capping of dredged sediment are problematic. EPA should remove contaminants from the river, not simply stored in or next to the river. It takes hundreds to thousands of years for substances to degrade. During that time, toxics can build up in the ecosystem and eventually be released into the Columbia River and ocean. Conditions of climate change, tectonic activity, and flooding increase likelihood of exposure."

Finally, the Port of Portland submitted comment withdrawing their support for the use of Terminal 4, including:

- "EPA has identified two disposal scenarios, one using only off-site landfills and another selecting a CDF at Terminal 4 for a portion of sediment disposal. The Port encourages EPA to retain optionality in the ROD to incorporate other disposal mechanisms not specifically presented for evaluation at the time of the feasibility study and proposed plan. This is critical because the Port has concluded that a Terminal 4 CDF is no longer the right decision for the Port. The Port continues to agree with EPA that the Terminal 4 CDF would be safe for people and the environment. However, given uncertainties in factors like cost, design, acceptance criteria, and performance criteria, the financial viability of the Terminal 4 CDF relative to other options appears marginal and could deteriorate if less expensive landfill or other disposal options materialize. Moreover, a CDF would be a significant, permanent commitment at Terminal 4, imposing long-term responsibilities on the Port and straining the Port's relationship with neighboring communities who have consistently opposed the CDF. For all these reasons, the Port has concluded that the CDF is not an appropriate use of limited Port resources."

EPA Response

The feasibility study report (USEPA 2016b) analyzed and the proposed plan (USEPA 2016c) described the two disposal options for dredged sediment resulting from the cleanup. The proposed plan indicated that the preferred disposal option was using a CDF and off-site disposal facilities for dredged sediment that was not suitable for a CDF. A CDF would reduce the number of bargeloads, trainloads, and/or truckloads of sediment requiring off-site disposal, reducing impacts to surrounding communities. Reducing the transport distance for disposal would also reduce the chance that accidents and/or spillage of contaminated sediment could occur. However, the primary benefit of off-site disposal of dredged material is that it avoids the long-term maintenance requirements of a CDF and impacts on the aquatic environment by filling approximately 14 acres. It also removes the waste completely out of the system, providing assurance that no recontamination will occur as a result of an unanticipated event impacting the integrity of the CDF structure. Further, off-site disposal transfers management of the waste to professionally-permitted waste handlers whose primary focus is the safe and effective handling of hazardous waste materials.

The Port of Portland, who was originally providing the land for the facility (at Terminal 4), indicated in its official comment submission that it has withdrawn its sponsorship of the CDF which impacts the implementability of the CDF. Because of this new circumstance, the small difference in cost savings using a CDF relative to overall project cost estimates, and the overwhelming sentiment expressed by the public against the CDF, EPA has decided to select off-site disposal for all dredged sediment as part of its final remedy.

2.14.2 Develop a Commercially-Viable Sediment and Soil Disposal Facility

Comment Summary

The City of St. Helens provided information about a proposal for developing an existing waterfront property (wastewater treatment lagoon) into a Resource Conservation and Recovery Act Subtitle D facility with barge transfer infrastructure that could be used to disposal of dredged contaminated sediments from the Portland Harbor Site.

EPA Response

EPA recognizes that potential significant cost savings could be realized if a geographically proximate disposal facility is available for disposal of dredged contaminated sediments and excavated river bank soils. In addition, a nearby facility could reduce air emissions of greenhouse gases and air toxics from diesel emissions. Such a facility would not be part of the CERCLA response but rather would be a permitted facility under the Resource Conservation and Recovery Act/State Hazardous Waste or Toxic Substances Control Act. If such a facility was permitted and was found acceptable under the Off-Site Rule, EPA would consider disposing of waste in that facility.

2.14.3 Revisit the Waste Disposal Designation for Sediment Adjacent to Arkema

Comment Summary

A comment was received stating that EPA has arbitrarily made more conservative assumptions for disposal of PTW defined by sediments containing DDx and NAPL than it has for PCBs, dioxin/furans, and P AHs. Based on current data, none of the sediment offshore of the Arkema site should be classified or handled as a federal- or state-listed hazardous waste, or as PTW requiring treatment.

EPA Response

Please see LSS Dispute Issue 3 (Appendix A of this document).

2.14.4 Explain the Cost Assumption for Treatment of PTW Near Arkema

Comment Summary

A comment was received disagreeing with the cost assumption that "cement solidification/stabilization, low temperature thermal desorption, and no treatment will be used in equal proportions to treat pesticide/chlorobenzene PTW" for the disposal of dredged sediment that meets EPA's PTW criteria offshore of the Arkema site.

EPA Response

Please see LSS Dispute Issue 3 (Appendix A of this document) for a response to this comment.

2.14.5 Use the Hazardous Waste Identification Rule Appropriately

Comment Summary

EPA disregards the scope and intent of the Hazardous Waste Identification Rule by placing arbitrary restrictions on what EPA believes can be placed into a CDF, if constructed. All of EPA's acceptance criteria for a CDF are arbitrary and must be removed. Disposal of dredged material must follow the Hazardous Waste Identification Rule as adopted by the state or follow the Resource Conservation and Recovery Act if disposed of at an upland landfill. EPA has correctly stated that Resource Conservation Recovery Act regulatory requirements (including the designation of waste sediment as either a federal- or state-only hazardous waste) do not apply to sediment placed in a CDF, it mischaracterizes the Clean Water Act requirement that the sediment must meet CDF acceptance criteria for this rule to apply.

EPA Response

Since EPA's selected remedy is not using an on-site CDF, the issue of what waste could go into a CDF is moot.

2.14.6 Be Aware of Additional Waste Management Needs

Comment Summary

The waste disposal narrative in the feasibility study report indicates that if Gasco MGP waste is found to be commingled with spent halogenated solvents from the Siltronic site, "the material will be classified as a Resource Conservation and Recovery Act listed hazardous waste for management and disposal purposes."

EPA Response

EPA notes that the discussion of material disposal in the Consent Order's statement of work is in the context of an early action sediment cleanup performed under an engineering evaluation/cost analysis prior to the harbor-wide ROD. The GASCO cleanup must comply with the ROD including disposal of MGP waste. MGP waste will be disposed of in a Subtitle C disposal facility, consistent with the December 2004 dispute. This categorization is based on regulatory, material handling (off-site tracking), and health and safety considerations that will be refined during design. EPA has taken into consideration the material disposal discussion presented in the Consent Order statement of work during development of the ROD for the Site. As noted in the feasibility study report (USEPA 2016b), F002-listed wastes that originated from Siltronic will be treated as such per applicable Resource Conservation and Recovery Act regulation.

2.14.7 The ROD Should Allow for Ex-Situ Characterization of Waste

Comment Summary

One comment was received stating that the ROD should allow for ex-situ characterization of waste as has occurred at other sediment sites. Other sites have demonstrated that ex-situ sampling of dredged material typically results in the removed and dewatered sediments being cleaner than anticipated based on in-situ characterization and oftentimes allows for nonhazardous disposal in a Subtitle D landfill.

EPA Response

In-situ sampling of sediments has been conducted to characterize the nature and extent of contamination in the river, as well as to identify potential sources of contamination. The feasibility study report (USEPA 2016b) is based on the environmental data collected and compiled by LWG and other parties since the inception of the Portland Harbor remedial investigation and feasibility study in 2001. Additional and more extensive site data will be collected during the design phase.

For disposal purposes, analytical testing results of dredged sediment will be used for waste classification and subsequent determinations of disposal facility acceptance, including any required pre-treatment or treatment of wastes. Data collected during remedial design will initially be used for this purpose. The actual amount of removed material subject to ex-situ treatment would depend on the analytical tests used to classify wastes in accordance with the ROD.

It should be noted that assumptions made for categories of waste, including PTW, and subsequent quantities for treatment and disposal were suitable and reasonably supported by existing data for purposes of evaluating and comparing cost and other balancing criteria for alternatives in the feasibility study report. The actual volumes for waste treatment and disposal will be determined during the remedial action.

2.14.8 Clarify Uncertainties for Assumptions on Ex-Situ Treatment and Transloading

Comment Summary

One comment was received from the City of Portland requesting clarification on EPA's assumptions about the location of a transloading facility and asks for flexibility to more fully evaluate the feasibility of a transloading and treatment facility within the Site. Ultimately, if a transloading facility is going to be located in the Harbor, the city requests that EPA work with the City to find an optimal location with the least amount of negative impact on the community.

EPA Response

Please see the Cost (Section 2.22) and Implementability (Section 2.21) responses in this responsiveness summary.

2.15 Innovative and Sustainable Technologies

2.15.1 Evaluate Emerging Technologies throughout the Process

Comment Summary

A total of 41 comments were received on this topic. About half were included in form emails and stated

- "Accept the new technology options that will reduce costs and improve long-term effectiveness. These may be conducted as pilot projects."

The remainder echoed this sentiment and some provided specific suggestions. Representative comments from that group are:

- "The feasibility study has not adequately included newer technologies, including dredging technologies that have been successful at other sites and could be much less invasive on the river and the river banks."
- "The potential for cost savings through the application of new technologies seems to be understated in the proposed Plan I. Future sites in other locations will benefit from knowledge gained from trying them on this site. We can benefit from the learning curve. Bacteria, sediment washing, and oven cooking to breakdown PCB's all have potential to minimize transportation expenses."
- "Look to newest techniques of dredging - Better than EPA's proposed dredging technique - Think outside the current box!"
- "I don't think what they're proposing, removal, containment, natural recovery, it's the old industrial model, and it's not very inspiring and even what they're proposing to do of these three components is simply not enough. I'm really disappointed that there's no bio remediation happening that I can discern."
- "I would like to see the most contaminated areas dredged and the poisonous material dealt with until it's no longer poisonous, not just moved to another site, especially if that site is still in a flood land area like is proposed. You know, maybe it can be used to make concrete for an airport strip or something far away or I like the idea of burning the chemicals out of it in a safe way."

- "Thank you for all that you are doing! Curious if conservation Districts are partnered in some way? I recently went to a wonderful workshop on mycollium /medicina mushrooms mycology and its potential for clean up even in salt water. I wonder if Ozone was pumped into rivers it would add to the healthiness of the water. Large scale sump pump filtrations and certain algae may be worth investigating also curious about dredging deep and composting the silt? P.S. I have a 7 stage reverse osmosis (kitchen version) and every 3 months I have to trade out the prefilters, and carbon filter, and Zeolite. I can see by observation how bad the NE Portland tap water is."

- "There are many emerging technologies available for river cleanup, yet it appears that EPA has not considered their use. Dredging techniques that clean more sediment more efficiently should be used."

- "Micro-Bac International's M-1000H microbial solution and Tri-Phasic12 nutrient solution has been successfully used to treat organic contamination in a harbor bottom in Italy. The bottom line is that the site could be treated in place for substantially less money than what has been proposed. If you still chose to dredge, it could be treated in your containment area with no need to cap."

- "Use new and emerging technologies, such as those developed by NASA, bio-remediation bacteria that works on PCBS and DDT's and dewatering on barges."

- "We want to use Nasa Dev redeployable Polmer blanket technology for inset removal of PCBs in approach to remove & treat PCBs sediments in place, eliminating the need for dredging ($) or capping. We want "NEW" technology to lower $.

- "One of the solutions for river cleanup is SALT. To some it is a dirty word in Portland. Salt can and does many things it is a cleanser - a neutralizer, plus ALL KINDS OF OTHER USES. My suggestion would be to drop or lace the bottom of the contaminated area with 50 LB salt blocks (these are salt blocks that are used by ranchers and feedlots that cattle have to have in their diet, THEY ALSO HAVE IODIZED AND SULPHUR SALT BLOCKS). I REALLY BELIEVE that salt blocks would neutralize the contaminated area, and it would eventually disappear!! That is my suggestion and it is worth looking into."

- "If your recovery plan for the Willamette River uses nature as a major element, then the plan needs to support nature to speed the process up. Fish are natural bio-concentrators and should be harvested in your recovery program to remove toxins from the river. At this time, catching fish is allowed in the Willamette, but the fisherman is advised not to keep the fish residing in this area year around because they have too high of levels of toxic substances in them. If you catch and release the fish, you are not removing the toxins from the environment. If you have a repository for the caught resident fish, the toxic substance can be taken out of the environment and concentrated for disposal. This can be set up like the BPA's northern Pike minnow program that is run by the Oregon Dept. of Fish and Wildlife in the state of Oregon. As the fish are given to ODFW to be disposed, the fisherman would be rewarded by either a dollar amount or by supplying them with safe hatchery trout. Sturgeon would be one of the resident fish not allowed to harvest in this plan. This plan: 1) May shorten the time to clean up the toxins loose in the water. 2) Removes toxic substances from the environment. 3) Improves the health of the resident fish by removing the sick and old. 4) Provides food or financial support for fishermen by offsetting the cost of fishing which makes the cost of buying a fishing license more cost effective. In other words, helps

the poor to be able to afford to fish for food. 5) Helps the ODFW to be a governmental agency that helps the poor instead of only helping the rich (those who can afford to fish and release their fish).

EPA Response

The NCP (March 8, 1990) which provides the blueprint for CERCLA response actions, encourages the consideration of innovative technologies. It notes: "*Today's rule [NCP preamble and regulation] also contains an expectation on the use of innovative technologies that EPA developed in response to numerous comments calling for increased emphasis on the diversification of treatment technologies used in site remediation. EPA supports such diversification and expects that it will generally be appropriate to investigate remedial alternatives that use innovative technologies when such technology offers the potential for comparable or superior treatment performance or implementability, fewer or lesser adverse impacts than other available approaches, or lower costs for similar levels of performance than demonstrated technologies. EPA considered a range of technologies as well as innovative technologies as part of the remedy investigation/feasibility study.*"

The process for identification and screening of remedial technologies is presented in Section 2.4 of the feasibility study report (USEPA 2016b). The remedial technologies that were retained for further consideration are based on site-specific data. The identified technology types are initially screened for technical implementability and then expanded into lists of potentially applicable process options, which are then screened further for effectiveness, implementability, and relative cost. Remedial technologies and process options that were retained were assembled into remedial alternatives as presented in Section 3 of the feasibility study report.

Many of the comments recommend that in-situ bioremediation (in-situ treatment with Micro-Bac International's M-1000H* microbial solution or other proprietary products) be included in the remedy; however, this remedial technology was not considered to be feasible because many of the contaminants at the Site are not biodegradable (heavy metals) or are very persistent in the environment (PCDD/F, PCB, and pesticides). In addition, many in-situ technologies present implementability concerns in a large river system. Although in-situ bioremediation technologies were not retained as a feasible remedial technology, biological degradation is an important part of the enhanced natural recovery and monitored natural recovery, which are the general response actions for the largest area of contaminated sediment in the preferred alternative. EPA does not consider in-river placement of iodized or sulfur salt blocks as a feasible technology for remediation at the Site because placement of salt along the top of the sediment bed would alter the chemistry in the biologically active zone of the river sediment and within the water column, which would be harmful to the benthic and aquatic communities. In addition, EPA is not aware of any remedial actions utilizing salt to successfully remediate sediment contaminated with the PCBs, PAHs, dioxin/furans, and DDx, which are the focused contaminants of concern at the Site. Encapsulation of contaminated sediment is a technology type that was included in the selected remedy, both on-site capping of sediment and river banks and in providing containment at off-site disposal facilities and landfills.

Dredged sediment containing any Resource Conservation and Recovery Act hazardous wastes, pesticide residue, or PTW related to non-aqueous phase liquid will be evaluated to determine the need for and extent of treatment appropriate for off-site disposal. While low temperature thermal desorption and solidification/stabilization are ex-situ treatment options considered in the feasibility study, other treatment options were retained and may be considered before the material is disposed as part of the

remedial design. EPA will consider such changes and will continue to communicate with the community on this issue.

Removing fish that have bioaccumulated COCs in their tissue was not identified as an appropriate and effective removal technology for addressing sources of contamination within the Site because other removal technologies (mechanical dredging) are much more effective in achieving the RAOs. EPA is interested in mechanisms to reduce the impacts of fish consumption advisories (which apply only to resident fish) on fisher communities. After issuance of the ROD further community outreach on cleanup, particularly, advisories, EPA will further our efforts to do outreach to fisher communities, including tribal, low-income, minority, and immigrant communities to identify such mechanisms and implement them where feasible.

2.15.2 Consider Suggestions for Alternate Established Technologies or Products

Comment Summary

Four comments were received suggesting the use of particular technologies at the Site. One was from a representative of an environmental product for dealing with contaminated sediment and had concerns over the specific references to proprietary products (AquaBlock and AquaGate) in the proposed plan. Another was from a proponent of induced polarization as a fast, cost-efficient geophysical tool for contaminant delineation to aid in the cleanup efforts. Another was from a purveyor of thermal treatment technology for use in treating PCBs, PAHs, dioxins, furans, and DDT. The final comment was from Volcano Partners LLC for use of their patented vitrification process and product (Cement-Lock® and Ecomelt®) to segregate and treat dredged sediments at their on-site facility.

EPA Response

Descriptions of general remedial technologies evaluated and the screening of these technologies can be found in feasibility study report Sections 2.3 and 2.4 (USEPA 2016b). These sections describe the use of sorptive and sorptive-reactive material as well as thermal desorption and vitrification, which are retained site-wide remedial technologies as shown in Table 2.4-1a-c of the feasibility study report.

The proposed plan (USEPA 2016c) describes specific products used in the assumptions for the cap designs for cost estimate transparency purposes and does not imply that these proprietary products are the only ones to be considered during the design phase. Excluding reference to AquaGate™ would affect the assumptions built into cost estimates and negatively alter the transparency of any associated cost estimates.

Geophysical mapping technologies, such as induced polarization, used to survey and refine contaminant extent in Portland Harbor can be considered during the design phase based on implementability, effectiveness, and cost among other considerations. However, the ROD does not contain details of potential alternative technologies that may be used for field investigations as well as remedial actions. EPA will extend consideration to technology alternatives (including additives, thermal treatment, and geophysical mapping) during the remedial design phase and will consider input from vendors, if appropriate.

2.15.3 Incorporate Relevant Sustainability Studies and Guidelines

Comment Summary

Several commenters cite the September 2016 *Portland Harbor Sustainability Project* report (NERA 2016), prepared by AECOM, NERA Economic Consulting, and SEA Environmental Decisions for a group

of PRPs. The report evaluates the three pillars of sustainability: environmental quality, economic viability, and social equity. The evaluation is based on:

- Analysis of cleanup costs and construction times
- Net environmental benefit analysis
- Human health risks.

The project surveyed community stakeholders and developed social indicators or metrics to score each alternative in terms of "stakeholder group values" and found progressively lower scores for environmental, economic, and social impacts for the larger alternatives. The commenters believed that these results should have carried more weight in EPA's evaluation of alternatives.

In addition, ExxonMobil suggests EPA has not followed its own guidance or White House directives. Attachment 1 to ExxonMobil's comments provides a *Path Forward for a Sustainable Remedy at Portland Harbor Superfund* Site, which outlines specific studies that should be conducted prior to finalizing the ROD.

EPA Response

The NCP provides the overall blueprint that EPA follows for response selection and implementing a CERCLA response. As noted in the August 2, 2016 memorandum titled: "Consideration of Greener Cleanup Activities in the Superfund Process" (Greener Cleanup Memo):

- *"Selecting and documenting greener cleanup activities in decision documents. Where greener cleanup activities are selected as part of the response action, they should be specifically addressed in the decision document. They should be treated in the same manner as any other integral part of alternatives being evaluated, consistent with the NCP (40 CFR 300.415 for removal actions and 300.430 for remedial actions) and CERCLA Guidance. For example, the decision document should explain how various alternatives were evaluated and provide the basis for the response action's selection; this explanation should include how specific greener cleanup activities are incorporated as part of alternatives and how the greener cleanup activities were evaluated considering the NCP nine-criteria evaluation for remedial actions and the three-criteria NTCRA evaluation."*

EPA's two threshold criteria for selecting a Superfund remedy are: (1) overall protection of human health and the environment and (2) compliance with applicable or relevant and appropriate requirements of federal and state environmental laws. Once these two criteria are satisfied, EPA determines the best balance of tradeoffs among the alternatives with respect to balancing criteria, one of which is shot-term effectiveness, and modifying criteria, including community acceptance, which includes a wide spectrum of often competing concerns. EPA conducted a detailed analysis of individual alternatives against the evaluation criteria, following guidance that is consistently applied among Superfund sites across the nation. The guidance cited by the commenter (*Safe and Sustainable Water Resources: Strategic Research Action Plan* 2016-2019 11, 22 and *Sustainable and Healthy Communities: Strategic Research Action Plan* 2016-2019 14) are issued by EPA's Office of Research and Development and not the EPA Office of Solid Waste and Emergency Response (now Office of Land and Emergency Management) which issues cleanup-related guidance documents. Neither CERCLA nor the NCP require a sustainability study such as what the commenter submitted as part of the remedy selection process. Sustainability related considerations may be applied to a selected remedy to enhance environmental

protections consistent with recent green remediation guidance. A cost-effectiveness evaluation is not a requirement for a feasibility study but rather is considered for selecting a remedy.

As noted in the 2016 Greener Cleanup Memo, EPA uses the CERCLA process. The portions of a sustainability study may or may not fit within the nine-criterion remedy evaluation framework. EPA is committed to consider activities that may minimize the environmental footprint of the response. EPA noted in the Greener Cleanup Memo:

- "*The decision document should present the specific activities' basis, including a concise discussion of how the greener cleanup activities will reduce the environmental footprint. Consistent with the NCP, considerations raised by other criteria cannot supplant 40 CFR 300.430 €(9)(iii)'s two threshold criteria (protect human health and the environment and comply with applicable or relevant and appropriate requirements (ARARs) unless a waiver is justified.) EPA does not have to select the alternative with the minimum environmental footprint. Rather, project managers and other decision-makers should consider greener cleanup activities in the context of a complete balancing criteria analysis for evaluating alternatives after determining that the alternative meets the threshold criteria of protectiveness and compliance with ARARs.*"

EPA acknowledges that remedial actions should incorporate greener cleanup activities wherever possible. These measures may include best management practices to reduce emissions of greenhouse gases and reduce emissions and/or exposure to pollutants such as diesel particulates, nitrous oxides, and sulfur oxides during implementation of the remedy. As described in Section 4.2.2.5 of the feasibility study report (USEPA 2016b), a green remediation plan will be required during remedial design, consistent with the EPA Region 10 *Clean and Green Policy*. An outline for the plan is provided in Appendix M of the feasibility study report. As noted above, EPA acknowledges the need to incorporate sustainability measures.

The four main goals identified by ExxonMobil in its *Path Forward for a Sustainable Remedy at Portland Harbor Superfund Site include the following topics*. For further responses to comments for each of these, see the referenced sections of this responsiveness summary:

- Reduce the uncertainty in exposure assumptions (Section 2.19.3)
- Improve stakeholder buy-in (Section 2.28 and 2.36)
- Validate the site conceptual model (Sections 2.12 and 2.21)
- Allow time for source control to be verified and equilibrium background levels to be established (Section 2.17)

2.16 Monitored Natural Recovery

2.16.1 The Proposed Plan Relies Too Heavily on MNR

Comment Summary

A total of 324 comments were received that spoke to this topic. Hundreds of comment postcards were received that followed a format with four or five talking points.

The most commonly seen form comments include:

- "The plan relies mostly on "Monitored Natural Recovery" which leaves polluted material in the river and simply monitors it over time"
- "The draft plan contains far too much MNR."
- "The draft cleanup plan relies too much on "monitored natural recovery," a "do nothing" strategy that leaves pollution in the river in the hopes that it will either be covered over or flushed downstream."
- "Monitored natural recovery, with or without enhancement has not been shown to be effective and therefore EPA needs to reduce its use and include provisions in the Record of Decision for contingency actions if monitoring data indicate unsatisfactory performance results."

Other representative personal comments include:

- "The 1,876 acres of "monitored natural recovery" will still contain PCBs, dioxins, and furans that "stay in the environment for a long time," according to EPA's proposal (page 3)."
- "I don't understand the logic of natural remediation when most of the toxics have been in place since WWII. That is by my calculations nearly three quarters of a century, only slightly older than I am. One would think that if the PCBs and dioxin were amenable to resolving by leaving them alone, they would be of no consequence."
- "I think the plan relies too much on "monitored natural recovery." A wait-and-see approach has not been working since heyday of river contamination in the 20th century; and it won't work any more quickly now. Given the ongoing disturbance of sediments by ocean-going shipping, the contaminants continue to emerge into our river. This wait-and-see, do-nothing approach is inadequate and will make all of us liable to the spread of contaminants downstream, into the Columbia River, and thence into the Pacific Ocean. This must not happen. The problems with "monitored natural recovery" are thrown into high relief when we consider the issue of who would be doing the monitoring 100 or 200 or 300 years from now. The toxins will still be toxic; will there be any responsible party present to monitor the recovery and upgrade the practices as necessary in case "monitored natural recovery" proves ineffective? Better to clean it up now, while we have the capacity to do so, and be done with it so subsequent generations are not faced with challenges they may not be able to meet."
- "Expecting nature to fix 86 percent of the river without intervention is a joke."
- "EPA and Lower Willamette Group found that PCB's are by far the most hazardous and the most widespread problem of the chemicals found to be in Portland Harbor and present for forty years. For over fifty years, dioxins in the form of Agent Orange and other herbicides were discharged and remain in the river. PAH's and other oil based chemicals have been in Portland Harbor for over eighty years. It was in the 1930's that the gas prepared coke was poured into Portland Harbor. The investigating and testing has taken place in the last twenty years demonstrating natural recovery has done little or nothing to remove them or prevent access to them therefore sufficient removal as proposed in the Alternative G should first and foremost be considered the best cleanup plan. These chemicals, left in the river continue pose health threats to humans and

wildlife continuing into the future for generations. In every level or Alternative suggested by EPA methods such as capping allows the contamination to be left in the river."

- "The concept of monitored recovery is much too passive and basically leaves pollution where it is hoping that there won't be problems in the future. We don't really know what problems have already been caused, yet, it is crystal clear that the pollutants are very toxic to the environment. The plan over-all, relies on letting the pollutants stay where they are while allowing the river to serve as a toxic waste dump."
- "Clean up methods should not leave persistent contaminants in or adjacent to the Willamette River. Clean up should include source control, include river sources. For the clean up to be considered complete, fish from the Willamette River should be safe for human consumptions at a rate of for greater then 8 oz. of fish per month. Please establish an action plan to limit contaminant spelling during sediment dredging. Please ensure that financial tools are in place in the event of recontamination."

EPA Response

MNR works when sediments transported from upstream into the Site are cleaner than those that exist at the Site. Natural recovery is likely to occur the fastest in depositional environments after source control actions and active remediation of higher concentration sediment have been completed. During natural recovery, deposition and mixing of cleaner sediments with the sediment bed results in lower surface sediment concentrations at the Site. Additionally, some contaminants degrade to lower, less problematic levels over time. Since recovery is dependent on the deposition and mixing of clean sediment with contaminated sediment, nearby sources of contamination can hinder natural recovery processes. That is one reason that EPA's proposed cleanup plan addresses the high concentration sediments and contaminated groundwater source areas.

The Willamette River is transitional, meaning that sediments move around. Deposition rates at the Site have been estimated based on a series of bathymetric surveys conducted between 2002 and 2009. Other lines of evidence that indicate deposition is occurring include grain size analysis and subsurface to surface sediment concentration ratios. Deposition of sediments occurs in the majority of the river during some point of the year. In other parts of the year, such as during periods of high flow, erosional conditions occur. Erosion also occurs in areas subject to wind- and wake-generated waves such as in nearshore areas. Boat propellers can also cause the sediment to move. Site conditions are conducive for MNR when contaminant concentrations are low and cover diffuse areas (USEPA 2005). These low contaminant concentration areas addressed by MNR for the selected remedy cover approximately 82 percent of the Site. MNR is less appropriate in areas of high concentrations and will occur slower in areas where deposition is infrequent. EPA reviewed the evidence provided in the feasibility study and concluded that MNR is likely to reduce surface sediment concentrations in the low-contamination areas that will remain following active remediation.

MNR requires regular monitoring of sediment, surface water, and biota tissue to assess trajectories toward reaching cleanup goals on a planned timeline. If, based on this monitoring, MNR is not working well or fast enough to meet these trajectories, additional actions may be required to meet the cleanup levels. Any additional action taken will depend on the reason that MNR is not working. If it is determined that there is a previously unknown or new source of contamination, that source would need to be identified and addressed. If MNR is not working as expected due to river conditions, the cleanup plan may need to be amended to require additional remedial action such as dredging or capping.

2.16.2 Consider Impacts on the Columbia River from Use of MNR

Comment Summary

Two comments were received that addressed the potential for impacts to the Columbia River from MNR use at the Site. The comments were from the Portland Audubon Society and stated:

1. EPA should carefully assess and describe potential impacts to the Columbia River resulting from its clean-up strategy. EPA relies on Monitored Natural Recovery across 86 percent of the Site. MNR depends upon a combination of deposition of clean sediment on top of contaminated sediment and dispersal downstream. The feasibility study report and proposed plan fail to characterize how much contaminated sediment is likely to get flushed downstream into the Columbia. While the Willamette will benefit from this strategy over time, the Columbia will pay the price. Notably, the areas directly downriver of the confluence include important Wildlife Areas such as the Sauvie Island Wildlife Area and the Ridgefield National Wildlife Refuge. They also include heavily used public beaches on Sauvie Island. Finally, they include potential NRDA mitigation sites such as the Alder Creek Site that has been developed by Wildlands at the southern tip of Sauvie Island.

   EPA's Report, Columbia River Basin: State of the River Report for Toxics 2009, notes that EPA joined other state, federal tribal, local and non-profit partners to form the Columbia River Toxics Reduction Working Group in 2005 with the goal of "reducing toxics in the Columbia River Basin and prevent further contamination." (EPA Columbia River Basin Toxics Report at page 1).

   It appears to us that EPA is sacrificing the health of the Columbia River in order to improve the health of the Willamette River by selecting Alternative I, which depends heavily on MNR rather than more environmental protective alternatives that rely more heavily on dredging. In order to meet important toxic reduction objectives on both rivers, EPA needs to evaluate the relative impacts of all alternatives on the Columbia River and incorporate the information into their alternative selection process. EPA should provide clear characterization of how the clean-up plan and specifically MNR is likely to impact toxic loads on the Columbia River, whether that will provide increased risk to humans or wildlife using natural areas and public areas near the confluence, increase risks to humans consuming fish on the Columbia, and how it might impact treaty rights along the Columbia River.

2. EPA should assess the risks presented by previously dredged materials that were removed from Portland Harbor and determine whether current disposal situations are sufficient to protect human and environmental health. For example, Portland Harbor Dredge spoils have been placed on West Hayden Island under the State's "Beneficial Use Policy" based on the incorrect assumption that the Site would be paved over and developed within 5 years. EPA should include in the clean-up plan, feasibility study report, and ROD a review of all contaminated materials that have been removed from Portland Harbor since it was listed under CERCLA, including their current location and whether the disposal scenario is sufficient to meet the standards established to protect public and environmental safety set out in the feasibility study report, proposed plan, and ROD. Sites that are not sufficient to meet the goals should have their own clean-up requirements incorporated into the plan. It is deeply disconcerting that EPA has allowed so much contaminated material to be redistributed outside of Portland Harbor prior to adopting a remedy and ROD, and we believe that in doing so, EPA has potentially distributed

toxic materials that pose a risk to people and wildlife over a far greater geographic area than was originally contaminated.

EPA Response

Please refer to responses to comments in Sections 2.16.1, 2.16.3, and 2.2.102 of this document, as well as ROD Section 9, 11, 12.8, 14.2.7, 14.2.10, and 14.4 regarding reduction of the reliance of the selected remedy on MNR, and the overall monitoring approach to verify that contaminant loading to the Columbia River and Multnomah Channel is being reduced.

It should be noted that EPA likely will not support the placement of contaminated material dredged from the area subject to this ROD nor the downtown reach in the Columbia River, if it exceeds human health PRGs or any of the ecological PRGs for bioaccumulation or other relevant exposure scenarios that would apply to unconfined in-river disposal. EPA will now review Clean Water Act § 404 permits in detail within and in some cases upstream of the Site to ensure that such work is consistent with the ROD.

2.16.3 MNR Mechanisms and Performance Are Not Understood

Comment Summary

Numerous comments were received relating to the performance of MNR as a technology at the Site. One commenter noted that the dynamics of sediment surface chemistry also have a direct effect on the calculation of RALs and evaluations of natural recovery and that these time-dependent RALs and their linkage to natural recovery estimates are one of the key characteristics of the selected remedy (i.e., they define where active remediation will take place).

Several commenters noted that a hydrodynamic sediment transport model should be used to evaluate natural recovery processes and support remedial decision making. It was noted that can tie together snap shots in time and reproduce underlying processes. It was also noted that the use of numerical fate and transport models is supported by EPA guidance. Finally, it was noted that without a model, the lines of evidence based on only limited empirical data result in a significant overdesign to compensate for uncertainties. Without a model, it is difficult to understand the causes of the changes in condition identified by future monitoring. Not using a model in a complex system like the Portland Harbor Site is directly contrary to current professional best practices.

One commenter stated that MNR presents several advantages because it is less invasive and more cost-effective and sustainable than other remedial alternatives. MNR, for example, requires less construction and infrastructure than other treatment options, and thus is usually much less disruptive of communities than active remedies such as dredging or in-situ capping, and it results in no contaminated materials being transported through communities.

Two commenters stated that heavy reliance on MNR as part of the site remedy was not supported by the science and that the historic record shows, contaminated sediments continue to remain exposed decades after the contamination originated. The commenters stated many of the contaminants found in Portland Harbor (including PCBs, heavy metals, dioxins, and furans) are extremely slow to degrade and therefore MNR is not an appropriate remedy to address these contaminants. Relying on MNR across such a large percentage of the Superfund Area will result in continued exposures of humans and wildlife to contaminants, recontamination of areas that have been decontaminated, and increased contamination of the Columbia River downstream from the Superfund Site.

One commenter noted that although there is evidence to suggest that over time clean sediment from upriver will deposit on the river bottom covering up contaminated sediments, the potential for exposure through bioturbation, earthquakes, floods and propeller wash remains. The commenter also noted the Willamette River does not offer the correct natural conditions to favor effective use of MNR, and should MNR be a component of the site remedy, monitoring should be conducted annually to ensure progress is acceptable and contingency plans should be included in the ROD for further action if progress is not satisfactory. Finally, one commenter questioned what exists showing MNR to be sufficient for remediation of the majority of the Site, and how was this natural recovery modeled?

EPA Response

MNR is a fundamental component of the remedy. As one commenter noted, the proposed plan (USEPA 2016c) properly employs MNR for a significant portion of the Site and is well supported by site conditions, the NCP, and EPA guidance. EPA's final remedy includes approximately 1,774 acres of MNR at the Site. As noted in many of the comments, a detailed hydrodynamic and sediment transport model was developed as part of the remedial investigation/feasibility study activities conducted by LWG.

EPA commissioned external expert reviews of this model, which identified several shortcomings that limit its usefulness in predicting sediment transport within the Site. A more detailed discussion of the limitations associated with the Portland Harbor hydrodynamic and sediment transport model is provided in Appendix H. An evaluation of predicted versus measured changes in sediment bed evaluation concluded that the Portland Harbor hydrodynamic and sediment transport model tends to over predict deposition, particularly in areas where erosion is measured. As a result, the utility of the contaminant fate and transport model developed for the Site to evaluate MNR is limited. In the feasibility study, outcomes greater than t=0 were not quantitatively evaluated using the hydrodynamic and sediment transport model because the results are not quantitatively accurate and absolute or relative comparisons among quantitatively inaccurate outcomes, is not helpful. However, quantitative evaluations of empirical data (trends in sediment deposition and fish tissue), where available, were undertaken.

A number of commenters noted that many of the evaluations presented in the feasibility study report (USEPA 2016b) were based on data that are not representative of current conditions and that the evaluation did not consider recent sediment data collected throughout the Site by Kleinfelder and in Swan Island Lagoon by Geosyntec showing MNR is occurring. Other commenters stated that the feasibility study did not properly evaluate fish tissue data collected in 2002, 2007, 2011 and 2012 that show MNR is occurring.

Regarding the fish tissue data, EPA conducted an evaluation of fish tissue data collected in 2011 and 2012 and compared that to fish tissue data collected in 2007. EPA did not include fish tissue data collected in 2002 in the evaluation because the 2002 data were comprised of composite fish tissue samples from both sides of the river. While the 2002 data may be relevant for risk assessment purposes, it obscures known site/source signatures that are on one side of the river. The 2007 fish tissue data were comprised of composite fish tissue samples from one side of the river. The 2011 and 2012 fish tissue data were comprised of individual fish tissue samples collected from each side of the river. An evaluation of temporal trends (of any media) requires consistent collection methodology over the evaluated time period. As a result, the evaluation was limited to 2007, 2011, and 2012 results collected from specific reaches and specific sides of the river. The results of the evaluation showed that in all but two instances (RMs 4E and 7E), concentration declines were not statistically distinguishable from zero.

The Kleinfelder and Geosyntec sediment data sets may be further considered in remedial design. Newly collected data sets will be evaluated to update areas of the Site where remediation is warranted and assess whether any areas have already achieved sediment cleanup levels. As noted above, EPA considered multiple lines of evidence to evaluate the effectiveness of MNR and concluded that MNR would be an effective remedy for approximately 1,900 acres of the Site. EPA agrees that MNR presents several advantages because it is less invasive and more cost-effective and sustainable than other remedial alternatives. However, MNR alone is not expected to result in a remedy that is protective of human health and the environment. As a result, MNR has been paired with the active remediation of contaminated sediments through capping and/or dredging.

Some commenters questioned whether MNR is adequate to address metals and bioaccumulative chemicals that do not degrade appreciably in the environment and whether MNR was appropriate due to the continued exposures of humans and wildlife to contaminants, recontamination of areas that have been decontaminated, and increased contamination of the Columbia River downstream from the Superfund Site. The commenters also stated that the primary natural recovery process is deposition of cleaner material over the top of contaminated sediments and, as a result anthropogenic and natural processes such as flood events and propeller wash may erode newly deposited sediments thus limiting the effectiveness of MNR. EPA recognizes the uncertainty associated with the long-term effectiveness and will rely on a robust long-term monitoring program to confirm the effectiveness of MNR.

Overall, EPA expects that some natural recovery of sediment contaminant concentrations may have occurred at the Site since the remedial investigation/feasibility study database was developed, and that it will continue to occur, especially following completion of source control efforts and remediation of the most heavily contaminated sediment bed. The process for implementing remedial action is designed to directly accommodate this recovery. Prior to any active remediation, the sediment bed will be re-sampled to update the active remediation footprint, and incorporate any natural recovery that has occurred. The updated remedial footprint, using contemporary surface and subsurface sediment data, will be used to apply the decision tree.

2.17 Monitoring and Contingency Actions

2.17.1 Provide Timelines and Metrics for Success

Comment Summary

A total of 1,333 comments were received on this topic. Almost all (98 percent) were received as form emails that said:

- ”EPA should set much clearer timelines and metrics for success including setting an explicit date by which Portland Harbor specific fish consumption advisories will be lifted.”

The remaining comments were personal and include:

- “Set metrics-based benchmarks for water quality improvement in the lower Columbia River.”
- “Include a clear plan for monitoring the success of cleanup activities with a contingency cleanup plan if natural remediation proves insufficient towards meeting cleanup goals.”
- “Monitoring is an invaluable evaluation tool that can be used to assess the completeness of remedy implementation, remedy effectiveness, and the need for contingency actions. The proposed cleanup plan does not clearly define how site progress will be evaluated and how

compliance with regulatory requirements and cleanup objectives will be measured. Without clearly outlining compliance criteria or metrics, a meaningful assessment of the project progress cannot occur. In addition, if the cleanup does not proceed as expected, there is no contingency plan in place to ensure protectiveness for human health and the environment. The ROD must include more adequate detail on how progress and compliance will be measured. More clear and specific information is needed on interim and long-term metrics, how and where they will be monitored or evaluated, timelines, and contingencies."

- "The National Remedy Review Board made it pretty clear that it expects the US EPA to set multiple clear deadlines, including a deadline for lifting the Fish Consumption Advisory, in this cleanup. How are people expected to weigh the effectiveness of various alternatives if a clear date is not set for lifting the Advisory? The lack of a clear timeline to lift the Fish Consumption Advisory will also make it difficult to hold EPA or PRPs accountable for implementing the cleanup plan in an effective matter, and meeting the specific objective included in the ROD. At the most basic level, this cleanup is about the ability for people to consume resident fish without increasing their cancer risk! EPA should select an Alternative that gets us to a specific date for lifting the Fish Consumption Advisory."
- "In a data-driven economy, EPA must set clearer timelines and metrics for clean-up success. If we can't measure it, then it didn't happen."
- "To fully evaluate the proposed action, the plan should, at a minimum, include:
    - A schedule of environmental sampling, accounting for seasonal and environmental variation, to ensure that the expected variance in response variables is accounted for and can be incorporated into the final analysis;
    - The environmental variables to be monitored and the methodology to be used;
    - A statistical design to monitor if actual changes in the chosen metrics, outside of natural variation, are occurring within the Site. There are numerous designs applicable, however, the BACI (Before-After-Control-Impact) may be the most useful when considering both the MNR and ENR sites;
    - A definition of "recovery" or "failure" that incorporates changes over time in the monitored environmental variables. This definition should also include a proposed timeline in which these desired outcomes would be observed if the plan is working, and;
    - A defined timeline and response if MNR sites are not recovering as expected or desired, wherein they could be converted to ENR sites to meet the goals of the Superfund proposed plan within the proposed timeline."

EPA Response

Timelines and metrics for many components of the cleanup will be further developed in the remedial design, after issuance of the ROD. Prior to remedy implementation, sampling will be conducted to establish baseline conditions for sediment, surface water, pore water, biota, fish tissue, and river banks. Sampling of these will continue through construction of the remedy, after construction is complete and in the long term. Sampling locations and frequency will be determined during design and in the future in

monitoring plans. It is premature to make those determinations in this ROD since the locations and frequency will depend on the purpose of the monitoring. Different needs for monitoring will require different sampling and monitoring plans.

EPA expects that fish consumption advisories may be less restrictive once the cleanup has been completed. However, since the relationship between sediment and fish tissue is not well understood, it is premature to establish a date for when this may occur. Further, fish consumption advisories likely will not be lifted completely due to larger watershed issues (such as mercury) and also because sediment concentrations of PCBs in "clean" areas upstream of Portland Harbor Site are higher than the acceptable risk range based on conservative risk estimates. Over time, it is expected that implementation of the selected remedy, source control actions on the part of DEQ in the Portland Harbor and watershed-wide (including upstream areas) actions will reduce or eliminate the need for fish consumption advisories. However, at this time it is not possible to determine a specific date when this will occur. Please see Section 2.3 of this responsiveness summary for more information about fish consumption advisories.

2.17.2 Ensure Fish Tissue Monitoring Is Conducted

Comment Summary

Twenty-nine comments were received that requested that contamination in fish was monitored. Roughly 75 percent were form comments received by email that stated:

- "The general goals and design characteristics/requirements of the fish tissue monitoring need to be specifically listed in the R.O.D."

The remaining comments were similar in content and include:

- "In addition to other fish, lamprey must be included in the monitoring. Lamprey are a critical component in the local ecosystem and to native diets and culture. Peoples who depend on lamprey are especially susceptible to heavy metals that are not cleaned from the CERCLA sites, as heavy metals are bioaccumulated in fatty tissues and lamprey are highly fatty. Exclusion of lamprey monitoring and reporting is a direct dismissal of the local indigenous peoples and their large presence in the Portland region."
- "A monitoring program should begin as soon as possible to establish a baseline monitoring levels of contamination in fish tissue is a must to determine benefits of biota and effectiveness of remediation overtime. We want monitoring of small/young/large mature fish (Carp, Sturgeon/Bass to see that they exhibit less contaminates over the phase of the cleanup. We want general goals and design characteristics/requirements of fish tissue monitoring listed record of decisions. We want to ensure all sampling and analytic methods are consistent throughout the duration of monitoring."
- "Fish contamination needs to be monitored to assess the changes with time and over space, beginning with a monitoring program to establish a clear baseline."
- "Testing of fish tissue needs to begin and continue throughout the construction phase A baseline for fish tissue contaminant levels needs to be established as soon as possible and continue throughout the construction process so the effects of the remedies can be reflected in the testing. The method of testing should be consistent between agencies and PRPS and should be established in the ROD so results can be compared over time to measure remedy success or failure."

EPA Response

EPA agrees that monitoring is a crucial part of the cleanup plan. Fish tissue sampling began in the remedial investigation and will continue through implementation and monitoring of the remedy. A monitoring plan will be developed after the ROD during remedial design and will outline the sampling, including fish tissue sampling, to be conducted to establish baseline concentrations. Additionally, it will include the monitoring to be conducted during and following construction to evaluate how the cleanup is achieving the cleanup levels, targets, and remedial action objectives.

The monitoring plan will include details of the fish sampling such as species, numbers, and size of fish. Monitoring will focus on resident fish that pose the greatest risk to human health, likely to include carp, bass, and catfish. Monitoring may also include tracking resident species to get a greater understanding of where their exposure occurs within the Site.

Lamprey and other fish that migrate through the Site, such as salmon, are not good indicators of reductions in tissue concentrations from contamination at the Site or success of the cleanup because these fish spend time away from the Site. However, impacts to migrating fish from the cleanup activities will be assessed and addressed through mitigation measures to minimize adverse impacts to these species. The monitoring plan will include a detailed description of the methods to be used in accordance with EPA's guidelines for establishing and meeting data quality objectives. It will be submitted to the National Marine Fisheries Service for review of the adequacy of sampling design and procedures for safe fish handling during construction to prevent injury to listed species.

2.17.3 Ensure In-River Monitoring Before, During, and After Remediation

Comment Summary

A total of 746 comments were received on this topic, and roughly 97 percent were in the form of a multi-bullet postcard having one bullet that read:

- "Include ongoing monitoring and cleanup upriver and downriver from the Site."

The remaining comments were personal comments that generally echoed that sentiment. Commenters also requested that monitoring begin immediately and last past cleanup and that there be a plan for monitoring that includes soil, air, water, and fish contamination. The use of buoys was also suggested.

Representative comments include:

- "Monitoring of the superfund site, all 11 miles, needs to start now and continue past the completion of the cleanup. They need to implement habitat restoration and that also should be monitored for years after to make sure that the area stays viable and animals and plants continue to live there."
- "EPA's proposed plan does not include a rigorous monitoring plan, nor alternatives that would be required if the monitoring indicates that the cleanup is not proceeding as planned. EPA must require long-term financial assurance that the monitoring will occur and the public will have access to the monitoring data over at least the next 20-30 years. Further, the cleanup plan must include mid-course corrections so we don't need to waste any further time studying options."

- "Collect baseline data on soil, air, water, and fish contamination as soon as possible. Require independent monitoring throughout the remediation period until clean, healthy levels are achieved."
- "I would also encourage EPA to use water quality monitoring data buoys as a form of providing live information regarding water quality for EPA and Oregon DEQ for contractor compliance with permitting agencies."

EPA Response

Monitoring is a crucial part of EPA's cleanup plan. Significant remedial design sampling to determine existing baseline levels of contamination and to design the cleanup will be conducted before the construction begins. Ongoing monitoring will be conducted to track the performance of the cleanup toward achieving the remedial action objectives and cleanup levels, and 5-year reviews will be conducted of the cleanup as required by CERCLA. Baseline sampling will include areas upstream and downstream of the Site.

DEQ has lead responsibility for identifying and controlling upland and upriver sources of contamination that may impact the river. Under this program, DEQ is addressing contamination in upland areas that include upland and in-river sources along the downtown reach of the river and contaminated groundwater. As sources further upriver are identified, EPA assumes those upriver sources will be addressed as well. Similarly, DEQ would address downriver sources of contamination to make sure they are not contributing to contaminant loading to the Columbia River.

During active remediation activities (such as dredging, capping, placement of clean sediment for ENR) there will be monitoring in the construction area as appropriate. The cleanup activities performed in the river will need to comply with water quality standards near where the activity is taking place. Air samples may be collected to make sure contaminants do not exceed worker health-based concentration levels in air. If contaminant levels exceed water or air quality standards, the work will be modified, and additional controls will be taken as needed. In addition, collection of sediment, surface water, pore water, and fish tissue samples will be collected as specified in a monitoring plan developed after the ROD.

Following construction, there will be long-term monitoring until the cleanup levels are achieved and beyond. The long-term monitoring program will include sediment, river banks, surface water, pore water, and fish tissue samples from upstream, within, and downstream of the Site. Passive samplers may also be used to supplement fish tissue data as a surrogate for fish tissue. Data on contaminant levels will be used for multiple purposes, such as to determine if natural recovery is taking place as expected or if any additional actions are required to achieve the cleanup levels on the planned timeline, track if fish tissue concentrations are decreasing, and monitor if the caps are effectively containing the contaminated sediment and/or groundwater. Data on contaminant levels in fish tissue will also help inform when and how the fish consumption advisory or other restrictions could be relaxed.

Long-term monitoring will also include regular inspections of the whole remedy, including sediment caps, to make sure they are effectively containing migration of COCs, in the proper place, have the required thickness and type of capping material, are achieving RAOs such as pore water standards, and are functioning as intended. Inspections may be required after natural events, such as earthquakes or floods, and manmade events such as boat collisions or violations of land use restrictions. Monitoring and maintenance of the caps would be required in perpetuity.

2.17.4 Require Quality of Life Monitoring throughout Remediation

Comment Summary

Forty-seven comments were received requesting "quality of life monitoring." About 45 percent were received as form emails and stated:

- "EPA needs to require installation of environmental and quality of life monitoring during the construction phase, with the PRP's covering the cost. This provision needs to be a required element and clearly stated."

Most of the remaining comments were personal comments that often went into more detail, stating that independent air, water, light, and noise monitoring should be conducted during cleanup to protect impacted neighborhoods. Requests related to this monitoring included expedited laboratory turnaround times for results (funded by polluters), results available to the public quickly (perhaps on a website), and for the requirement to be documented in the ROD.

Representative comments include:

- "During the time of active cleanup air and water quality monitoring is necessary to ensure health of workers and adjacent neighborhoods or any neighborhoods affected by construction."
- "Monitoring of air, water, odor and noise, daily, used while in construction phase with quick testing turnaround and adjustments, particularly when near affected communities for quality of life."
- "Livability and Environmental monitoring. Monitoring of both air and water needs to occur at regular intervals downriver of construction work including into the Multnomah Channel, Columbia River to keep excess contamination in check. Care should be taken especially to monitor PCB release into the air. An action plan should be in place to immediately address excess contamination of air or water. The ROD should include a requirement for monitoring of the environment as well as regular EPA reports online or by other easily accessible means to the community about specific activities during construction, as well as air and water monitoring results. Laboratory turnaround times for results should be as expedient as possible and funded by polluters. Monitoring of lights, odors, noise and all other possible issues that could affect livability of surrounding residential neighbors should also be required in the ROD. Neighbors should have an easy means of contacting EPA such as an 800 number, if livability problems need to be reported."
- "I would like independent air, water, light, and noise monitoring during cleanup - protecting impacted neighborhoods."
- "Monitor air, water, odor and noise, daily, while in construction phase with quick testing turnaround and adjustments, particularly when near affected communities for quality of life. Twenty-four (24) hour dredging could be acceptable with those caveats."

EPA Response

The ROD describes the final selected remedy and the underlying information that supports the decision. Specific details of how the selected remedy will be implemented are often not included in the ROD but are developed in the remedial design which begins after the ROD is signed. EPA will develop a

monitoring program during the remedial design phase and will consider public input as the plan is being developed. A comprehensive monitoring program to establish the baseline for sediment, fish tissue, surface water, and (as needed) air will be conducted at the beginning of remedial design. Concerns about air quality, noise, odor, light, and other potential community impacts will also be considered and addressed to the extent possible. Exceedances of health-based standards may result in additional controls being put in place so that construction impacts are mitigated to the extent practicable. EPA will provide contact information for community members to raise complaints or concerns during construction.

2.17.5 Ensure Costs for Monitoring in Perpetuity Are Included

Comment Summary

Thirty-five comments were received on this topic. Twenty comments were included in form emails and stated:

- "This remedy will have features that must be maintained in perpetuity and thus analyses need to account for a longer time frame in estimating costs and benefits."

Several other comments noted that the costs needed to be estimated over a period of at least 100 years. Other comments expanded on this theme and included:

- "Since many of the pollutants (PCB's, dioxans/furans, DDT's, and metals) are known to resist degradation by natural processes the ROD needs to require and include the costs of monitoring pollution levels and solving problems for a greatly extended period at the expense of the polluters."
- "We must utilize capping technology, where clean materials are put over contaminated sediments to hold them in place only where it is technically feasible, and where it will never impede navigation. We must also realize that capping has costs for the long-term with perpetual monitoring that adds to the cost of such measures."
- "We must realize that capping has costs for the long-term with perpetual monitoring that adds to the cost of such measures."
- "Time frame for cleanup needs to be 100 yrs. Minimum. When EPA suggests that the timeframe, the usual practice for estimating a remedy's long-term cost is to assume a 30-year period of analysis but this is inadequate. In the late 1970's, Portland citizens believed that the Willamette had been finally cleaned up. Since then, the city spent 14 years to correct that inadequate assumption by building the "Big Pipe" costing $1.5 billion dollars. Thirty years is an inadequate time allotment unless repeating the Superfund process seems satisfactory. In addition, with a minimum of 14 areas of capping to monitor and maintain, thirty years of sustenance seems very insufficient."
- "Long term effectiveness and permanence need careful consideration. Given the proposed plan's reliance on monitored or enhanced natural recovery, the time frame of monitoring needs to be extended out beyond 100 years or more. Many of the toxins in the river show little evidence of degrading in the many years they have already been in the river. If they are to be controlled in perpetuity by capping or similar means, provisions need to be made to maintain the integrity of these barriers as long as the toxins remain active."

- "Time frame for estimated costs needs to be longer, at least 100 years, recognizing that the remedy includes monitoring in perpetuity."
- "Because this cleanup will have features that must be maintained for decades to come, the analyses and monitoring plans need to account for a longer timeframe in estimating costs and benefits than is currently being contemplated."

EPA Response

EPA recognizes the implications of long-term monitoring on the overall cost of the remedial alternatives. The alternatives retained for detailed analysis all have sediment containment and capping components that will require perpetual maintenance and monitoring. However, evaluation of long durations of maintenance and monitoring is generally not necessary for comparative evaluation between alternatives, because of the effects of cost discounting in later years under present value analysis. The period of analysis for the feasibility study report (USEPA 2016b) is assumed to be 30 years because the increase of present value cost due to small periodic expenditures for maintenance and monitoring after 30 years is minimal relative to the accuracy range of the estimates.

As part of the sensitivity analysis in the feasibility study report (Appendix N), a timeframe of 100 years was also evaluated to assess the costs of long-term monitoring and maintaining the caps beyond the 30-year period used to compare costs between alternatives. As illustrated in Tables N-1 and Figures N-1a through N-1f, while the non-discounted costs for each alternative increase as the period of analysis increases from 30 years to 100 years, the present value (discounted) cost increase is very minimal after year 30.

2.17.6 Address Issues with Site-Specific Background

Comment Summary

Comments pertaining to the calculation and use of background concentrations were submitted by 10 local businesses, many of which are PRPs. The individual comments are too long to repeat verbatim here, but the specific issues are captured below:

- Sediment background dataset is very limited, collected over too many years, and should include data from the downtown Portland reach.
- Background data were incorrectly discarded as outliers and background concentrations were incorrectly calculated because the tests to identify outliers assumed a normal distribution.
- Background sediment concentrations should be expressed as a range and should consider a sediment equilibrium value.
- Accurate characterization of site-specific background is needed, and EPA's evaluation has resulted in unrealistically low background values such that PRGs are less than concentrations in stormwater and other ongoing upstream and upland sources.
- Background concentrations need to be developed for surface water and fish tissue.
- Background concentrations should be developed for all COCs.
- Background concentrations need to be reevaluated prior to issuing the ROD so the selected remedy is "achievable."

EPA Response

Proper development and use of a site-specific background dataset is an important element in the remedial alternatives evaluated for the feasibility study. In consultation with EPA, DEQ, and the tribes, LWG selected the reference area for determining background sediment concentrations. As described in Section 7.2 of the remedial investigation report (USEPA 2016a), this area is comprised of the upriver reach of the lower Willamette River, extending from the upstream end of Ross Island (just upstream of the downtown Portland area) to approximately 2.5 miles above Willamette Falls (RM 15.3 to 28.4). A total of 48 sediment samples in the background reference area were analyzed for PCBs as Aroclors and 33 sediment samples were analyzed for PCBs as congeners. Of these PCB samples, four were identified as outliers and removed from the data set. Sample counts for the remaining COCs analyzed ranged from 48 to 71 sediment samples. The data set primarily contains data from five investigations performed from 2004 to 2007, and one investigation performed in 1999. Although the data were collected over several years, this span of time is not unusual for large Superfund sites consisting of multiple investigations.

Sediment data from the downtown Portland reach of the lower Willamette River were not included in the background dataset. One reason is that reports submitted to EPA by LWG noted that the Site is subject to tidal influence, which results in a flow reversal of the lower Willamette River through at least the downtown reach. Site-related sources have also been identified in the downtown reach such sediment sample results from this reach of the Willamette River are not representative of non-site related data. A background reference area upstream of the downtown reach was selected so that the background data are more representative of the entire Willamette River watershed, and not an adjacent area with a greater potential of in-river and upland sources.

To identify and address outliers, EPA used an approach that is consistent with the recommendations of the ProUCL Version 5.0.00 User Guide and Technical Manual. The ProUCL User Guide and Technical Manual directly discuss the issue of identifying and addressing outliers and provide EPA's most recent, comprehensive discussion of this issue. These documents recommend the use of statistical tests such as: (a) Rosner's and Dixon's tests to identify outliers; (b) the use of graphical displays, including box plots and Q-Q Plots, to compare against and along with the results of the statistical tests; (c) the consideration of historical and current site and regional information to identify suspected outliers (extreme values coming from the far tails of the data); and (d) the performance of decision-making statistical computations with and without the suspected outliers before decisions to exclude data/datum as outliers are made. Further justification for this approach is provided in EPA's dispute decision letter to LWG dated March 24, 2015 (USEPA 2016d) [AR Doc #500011627] (Appendix A of this document).

Using the recommended approach in the ProUCL guidance, EPA compared the results of statistical outlier tests performed by ProUCL Version 5.0.00 with the visual observations of outliers and found that the two approaches generally found the same outliers. For example, the statistical approach identified five outliers from the PCB Aroclor dataset and the visual approach identified four. In addition, EPA used SCOUT to conduct a more robust statistical test of the PCB Aroclor data, and this approach identified 8 potential outliers, four extreme and four intermediate, and after reviewing the results of this analysis, EPA concluded that only the four extreme values were outliers. Thus, EPA selected fewer outliers than were identified in the statistical tests it employed. EPA also considered the effects of removing successive outliers for PCBs as Aroclors, PCBs as congeners and DDx. Before a decision to exclude datum as outliers, EPA compared statistical endpoints of datasets which included and excluded the suspected outliers.

Based on these evaluations, EPA removed four outliers from the Aroclor data set, and then corrected the upper prediction limit and upper confidence limit for organic carbon content using a methodology developed by LWG and approved by EPA. With the exception of performing the SCOUT analysis, EPA performed the same analysis for all indicator contaminants. EPA excluded data for background determinations for the following indicator contaminants: arsenic, total chlordane, DDx, BEHP, total PAHs, PCBs as Aroclors, PCB as congeners, Total PCDFs/PCDDs, and zinc.

EPA did not assume a normal distribution of data but instead, consistent with its guidance, removed outliers after appropriately analyzing the data. As recommended by the ProUCL Technical Guide, EPA used raw data to run outlier tests and initiated the ProUCL analysis without transforming the data. EPA then used ProUCL Version 5.0.00 to compute statistics and identify how well the data fit various distributions, such that EPA not only evaluated representations of data that were normally distributed but also evaluated other distributions identified by ProUCL. ProUCL is programmed to automatically model and graphically display the data to determine the appropriate distribution data and statistical methods for the selected distribution(s). EPA guidance generally cautions against using a lognormal distribution unless the data are only mildly skewed. In cases where the data are more than mildly skewed, the use of lognormal distributions tend to accommodate outliers and yield inflated or distorted values for upper confidence limits, upper prediction limits, and upper tolerance limits.

EPA selected single values for background concentrations and did not use as a range of concentrations to represent background concentrations as suggested by EVRAZ Inc. EPA recognizes that background concentrations are variable but a single value is needed for comparison purposes. EPA does endorse the concept of equilibrium, however, the necessary information (sediment trend data) is not available to conduct an equilibrium evaluation in the long-term. EPA has developed background concentrations consistent with EPA policy and guidance. EPA has further looked at the sediment traps deployed in the upriver reach, which corroborate with the values developed from the upriver sediment.

In response to commenters who stated that EPA's background evaluation resulted in unrealistically low background values, such that PRGs are less than concentrations in stormwater and other ongoing upstream and upland sources, EPA followed the current guidance and procedures to select background concentrations applicable to the Site. To minimize the effect of recontamination and continue to reduce fish tissue concentrations after cleanup, EPA and DEQ are committed to controlling upstream and upland sources to reduce ongoing impacts to the Willamette River.

EPA did not develop background concentrations for surface water and fish tissue in the feasibility study report (USEPA 2016b) because there were insufficient data to statistically compute background concentrations. Further, since human health surface water PRGs are based primarily on ARARs, EPA would need to waive the ARAR, which means information would be needed to show that achieving the ARAR is technically impracticable, there is no such information at this time.

Neither the remedial investigation nor the 2016 feasibility study presented background concentrations for all COCs in sediment because the remedial investigation report concluded there were insufficient detections to determine background concentrations for 2,3,7,8-TCDD eq, aldrin, dieldrin, DDT, Lindane, and TBT. The exception is TPH-diesel in which a background concentration was calculated in the remedial investigation report, Appendix H, but was inadvertently omitted from Table 2.2-9 in the 2016 feasibility study report. The background concentration is 61 milligrams per kilogram, which would not change the selection of the PRG, which is 91 milligrams per kilogram, since the risk-based number is greater than background.

Based on careful analysis of available information, EPA believes that the sediment background concentrations selected are representative of the entire Willamette watershed, and the selected remedy is achievable. The selected remedy requires active cleanup to the RALs and then relies on ENR and MNR to further reduce contaminant concentrations to meet the cleanup levels. Post-construction monitoring will be conducted to evaluate the effectiveness of ENR and MNR and its ability to achieve remediation goals.

Additional information regarding EPA's position on the establishment of background concentrations is provided in EPA's March 24, 2015 Letter to Bob Wyatt of LWG, "Re: Dispute Decision Regarding Lower Willamette Group Dispute dated August 26, 2014" [AR Doc #500011627], EPA's position to LWG Dispute Issues 1g and 1h, and LSS Dispute Issues 8 and 11a (Appendix A of this document).

2.18 Overall Protection of Human Health and the Environment

2.18.1 The Preferred Alternative is Too Protective

Comment Summary

Comments on the overall protectiveness of the preferred alternative in the proposed plan were received from five commenters. Several commenters expressed concerns that the level of protectiveness is set too high without any scientifically defensible basis and that EPA is undermining the Oregon Health Authority's and Agency for Toxic Substance Disease Registry's definition of protectiveness (especially as it pertains to fish consumption advisories) with no "credible data." Several commenters stated this level of protectiveness is unobtainable due to upstream contamination and the surrounding urban environment. Some commenters sighted unreasonable fish consumption assumptions as the source of the excess protectiveness. Additionally, commenters were concerned that capping was considered less protective, the comprehensive benthic risk approach was "abandoned," and protectiveness was based on unsupported benthic risk.

Commenters suggested that Alternatives B, C, and D were unjustifiably eliminated, arguing several individual factors showed these alternatives to be similar to other alternatives. They also suggested natural recovery should be considered as part of the remedial action protectiveness for Alternatives B and D to boost the alternatives' overall protectiveness. Some suggested that since no alternatives completely addressed ecological risk, Alternative B benefits may exceed its disadvantages. The Swan Island Optimized Alternative was also referenced in several comment letters as having protectiveness equal to Alternative I for the Swan Island Lagoon. One commenter stated EPA did not provide the basis for whether the increased costs and risks (during transport) for the dredging and upland disposal associated with Alternatives E, F, G, and I are worth the environment benefit for those alternatives compared to Alternative B.

EPA Response

The NCP describes how alternatives should be developed in the feasibility study through the establishment of remedial action objectives and preliminary remediation goals that protect human health and the environment and defines what is generally protective risk levels (40 CFR 300.430(e)(2)). The NCP further describes how the detailed analysis of alternatives should be conducted. 40 CFR §300.430(e)(9). Regarding overall protection of human health and the environment, the NCP (40 CFR §300.430(e)(9)(iii)(A)) states "Overall protection of human health and the environment draws on the assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs." EPA's alternatives evaluation was consistent with the NCP and drew from these other criteria. While it is not the intention or desire to

"undermine" local agencies, the NCP defines what level of risk is protective and it is those standards that EPA must consider in making CERCLA remedy decisions.

Alternatives B and D were not “abandoned” due to factors outlined by the commenters. Assertions by commenters that alternatives were eliminated based on individual factors do not accurately represent the actual process. While those factors were considered, the final determination was based on a broad-based evolution as discussed in LWG Dispute Issue 1a (Appendix A of this document). Due to the evaluation results discussed in the dispute response, it is not consistent with guidance to select Alternative B simply because no alternatives fully meet environmental protectiveness RAOs, at the completion of construction. We anticipate that the RAOs and cleanup levels, including the fish tissue levels will be achieved at the end of the cleanup. All alternatives exhibited different levels of certainty as to meeting the RAOs at the completion of the construction. All alternatives meet or fail to meet different RAOs to different extents with various levels of uncertainty. Alternative C was deemed to be too similar to Alternatives B and D, and so it was not retained for further evaluation.

Regarding the comment that EPA did not provide the basis for whether the increased costs and risks associated with Alternatives E, F, G, and I are worth the added protectiveness of those alternatives compared to Alternative B, the 2016 feasibility study report (USEPA 2016b) presents EPA’s evaluation of each alternative. Although Alternative B would have the least impact to the community, the feasibility study states that due to the reliance on MNR and ICs, Alternative B does not meet interim targets established for risks and hazard indices in a reasonable timeframe. Alternative B, in conjunction with adequate upland and upriver source control measures, would not achieve numeric human health and aquatic life water quality criteria and drinking water MCLGs and MCLs. EPA’s analysis also shows that Alternative B does not sufficiently reduce the load of contamination from sediment to surface water such that water quality ARARs could be achieved.

EPA did not quantify and evaluate natural recovery for alternates because natural recovery is a complex natural process that can be easily disrupted by uncontrollable environmental factors. As such, EPA sought to reduce the uncertainty surrounding natural recovery by relying on active remedial technologies to the extent feasible to increase the certainty that natural recovery will be effective and shorten the timeframe over which it is ostensibly being relied upon. Difficulties in estimating and relying on MNR are also discussed in the MNR Response.

EPA does not consider capping to diminish the protectiveness of any alternative. Capping was considered not to be effective in some areas based on site characteristics such as the need for maintenance dredging, anchoring or others. Capping also has associated long-term maintenance and monitoring costs, which can make it less cost effective, and depending on future use, potentially a less permanent cleanup technology in some areas. However, it is considered an effective remedial approach for many areas, which is why it is considered throughout much of the Site.

Several commenters expressed concerns that the use of benthic risk in association with protectiveness was not appropriate or technically based. EPA’s response on this issue is addressed in LWG Dispute Issue 1b (Appendix A of this document). Some commenters questioned why the comprehensive benthic risk area was not used. EPA has responded to this comment in LWG Dispute Issue 1a (Appendix A of this document). The response to benthic risk (Section 2.34.1 of this responsiveness summary) can also be referenced for additional information.

As noted in the feasibility study report, interim targets for risks and hazard indices were used to evaluate the potential for achievement of PRGs in a reasonable time frame among other matrices. For RAO 5, the interim target is based on multiplying the RAO 5 PRG by an order of magnitude to account for further reductions due to MNR. In addition, the post-construction interim target for RAO 5 was set at a 50 percent reduction in the area posing unacceptable benthic risk because risks to the benthic community are based on a population level rather than individual level effect and is considered a target to which the benthic population, as a whole, can be stressed and still recover.

EPA notes that the protectiveness for the Swan Island "optimized remedial alternative" provided by the Swan Island group is similar with respect to the time to achieve protectiveness to that provided by the preferred remedy. The ROD outlines measures to provide flexibility, based on empirical data, in remedial design to evaluate which remedial technologies are appropriate in that area.

2.18.2 The Preferred Alternative is Not Protective Enough

Comment Summary

Contrary to the argument that the Preferred Alternative was too protective, other commenters (Portland Audubon Society and the CAG) expressed concerns that the preferred alternative is not protective enough and failed to meet threshold criteria. Additionally, the commenters suggested that the preferred alternative would leave the rivers heavily contaminated for decades and sacrifice human and environmental health for low cost for PRPs. Commenters summarized and sighted RAOs not being met for all alternatives and ICs and MNR were called unproven approaches.

EPA Response

After reviewing and considering public comments, EPA selected a remedy that addresses more contamination with dredging and capping (Alternative F Modified). EPA evaluated post construction reductions using SEDCAM Modeling results, which showed that the selected remedy is protective within a reasonable timeframe given the uncertainty in the model. See also Sections 2.1, 2.3, 2.7, and 2.31 of this responsiveness summary and LWG Dispute Issue 1h (Appendix A of this document).

ICs will be in place to protect human health which aligns with NCP guidance. Contrary to commenter assertions, ICs and MNR have been effectively used at numerous sites. Fish advisory ICs are discussed in detail in Section 2.28 of this responsiveness summary.

2.19 Long-term Effectiveness and Permanence

2.19.1 Long-term Effectiveness Was Not Properly Evaluated

Comment Summary

Multiple commenters suggested that EPA's long-term effectiveness evaluation did not conform to CERCLA, NCP, and/or EPA guidance because it was not quantitative or detailed. They disagreed with the use of interim targets saying that they were contrary to guidance. Union Pacific asserted, "the record provides no basis for EPA to assume that one alternative will perform better than another with respect to meeting cleanup goals, ARARs, or interim targets within a 'reasonable time frame.'" Over the long-term, LWG took issue with the evaluation indicating that Alternative B would not meet chemical-specific ARARs 'in a reasonable timeframe,' sighting that "… EPA has no quantitative method to assess the long-term outcomes of the alternatives." Commenters also asked EPA to clarify what is the referenced "reasonable timeframe" to achieve cleanup levels. Additionally, LWG was concerned that Alternative D should not have been ranked low for long-term effectiveness as a result of EPA's goal to "maximize permanence through removal of highly contaminated sediment" because guidance states that mass

removal is not an appropriate way to evaluate sediment remediation alternatives; rather the evaluation must address reduction in risk.

Commenters critiqued the evaluation for not considering river equilibrium with ongoing contaminant loading from upland and upstream, and having a statistically flawed approach for calculating background concentrations. LWG argued that the Lower Duwamish proposed plan and Grasse River ROD evaluated sediment transport and background loading (respectively), and incorporated those considerations in to final decisions; thus, EPA should do the same. EPA was asked to recognize that source control could not eliminate contaminant inputs from stormwater. The Swan Island Group pointed out, "… long-term success of sediment remedies relies on source control and reducing external sources of contamination."

In addition to the assertion the interim targets are not in-line with NCP guidance, commenters expressed several other concerns that interim targets are not relevant for assessing long-term effectiveness because:

- The evaluation focuses "… almost exclusively on SWACs immediately post-construction … [with] no quantitative estimates of long-term alternative outcomes …."
- There are better ways to evaluate long-term effectiveness. "EPA could have easily devised empirically based estimates of long-term outcomes of the alternatives without resorting to complex computer models [,]" but "… ignored recent data (provided by LWG) that could be used in long-term effectiveness evaluation"
- The evaluation assumes "… that EPA's PRGs are met immediately [after construction]. … This … does not reflect the likelihood that river conditions will rapidly regress to background levels which exceed EPA's PRGs and health-based goals."
- "… the effectiveness analysis fails to consider natural recovery during or after construction and as augmented by enhanced natural recovery that EPA relies upon to meet PRGs in the long term."
- "To analyze relative long-term effectiveness and cost-effectiveness, EPA must provide some estimate of the SWACs and risk reduction in the years following completion of construction."
- No alternative could be shown to meets all interim targets and all but Alternative G failed to meet at least half of the interim targets.

Commenters expressed concern that EPA is not adequately considering long-term effectiveness or residual risk beyond construction completion and lacks a technically defensible projection of long-term performance. They indicate the impact of ENR was not included in the long-term effectiveness evaluation, and question how EPA can claim that MNR cannot be quantitatively estimated, while assuming PRGs will be met through MNR in 30 years, and determining that Alternative B and D will achieve cleanup goals. Additionally, commenters suggest EPA should take natural attenuation into account that is likely to occur during planning and construction phases, and suggests EPA should not assume that post-construction SWACs will remain constant.

LWG commented that Post Construction SWACs/risk estimates are "useless to assess long-term effectiveness of the alternatives" due to:

- Inconsistent PRGs
- Spatial Scales inconsistent with risk assessments
- Flawed SWACS
- Flawed Risk Assessment
- Errors in EPA's surface water analysis

Multiple other parties summarized EPAs long-term effectiveness analysis and expressed concern that only Alternative G came close to meeting RAOs, and recommended that a more aggressive option than G was needed to adequately protect human and environmental health. Additionally, they argue that long-term effectiveness and permanence should be prioritized over short-term effectiveness and cost.

EPA Response

EPA evaluated long-term effectiveness in accordance with the NCP. In accordance with the NCP (40 CFR §300.430), alternatives were assessed for the long-term effectiveness and permanence they afford, based primarily on:

- "Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities"
- "Adequacy and reliability of controls such as containment systems and ICs that are necessary to manage treatment residuals and untreated waste."

As described in Section 4.1.5 of the feasibility study report (USEPA 2016b), long-term effectiveness and permanence refers to the expected residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time, once PRGs are achieved. This criterion includes the consideration of residual risk that will remain on-site following remediation and the adequacy and reliability of engineering (remedial technologies) and ICs to manage those risks posed by treatment residuals and/or untreated wastes.

EPA's evaluation of long-term effectiveness was both quantitative and detailed. The evaluation of risk reduction from each alternative was conducted by estimating the post construction sediment concentration, estimating the fish tissue concentration through the food web model and estimating the residual risk based on a comparison to PRGs. The impact of ENR was not considered in the estimate of post construction sediment concentrations in the feasibility study, even though it is acknowledged that ENR would reduce risk also. Post construction sediment concentrations/ SWACs are discussed in Section 2.7.2 of this responsiveness summary.

The selected remedy, Alternative F Modified reduces more risks than Alternative I at the end of construction and minimizes reliance on ICs.

Most related comments are focused on the desire for quantitative determinations of the time that various alternatives will achieve ARARs or PRGs. However, that topic relates specifically to short-term effectiveness, not long-term, in the NCP, and is one of four items to be considered in evaluating that criteria:

"(E) Short-term effectiveness. The short-term impacts of alternatives shall be assessed considering the following:

(1) Short-term risks that might be posed to the community during implementation of an alternative;

(2) Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures;

(3) Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and

(4) Time until protection is achieved."

All alternatives would be considered protective at the end of construction with the use of ICs to reduce fish consumption to acceptable levels. The balance of trade-offs was central to selecting a remedy with a balance of active remediation and natural recovery to ensure a faster pace of risk reduction with additional certainty relative to permanence of the overall remedy. For more information about the role of fish advisories, see Section 2.28.2 of this responsiveness summary.

As described in the MNR response (Section 2.16 of this responsiveness summary), the environmental processes that support natural recovery are present in the river (incoming sediment loads promoting burial and dilution, contaminant declines through dispersion, and degradation of some compounds) and will be hastened when in-river and upland sources of contamination are eliminated. However, the complex nature of the Site and the limited data set to demonstrate the rate of improvement in water, sediment, and fish tissue contaminant concentrations restrict the ability to make quantitative determinations of contaminant declines following remediation based on empirical analyses or mechanistic modeling. Therefore, estimates of the post-remediation condition are used to gauge environmental improvement from remedial action. The active remediation components of the selected remedy do not achieve PRGs in all areas after construction, and rely on natural recovery and robust post-remedy monitoring of water, sediment, and fish tissue contaminant concentrations to establish attainment of remedial cleanup levels, source control effectiveness ongoing evaluations, or the need for additional remediation through the five-year review process.

2.19.2 Risk Management Was Not Properly Considered

Comment Summary

A number of comments were received that noted that EPA did not consider risk management in the selection of COCs, development of remediation goals and the development and evaluation of remedial action alternatives. It was stated that EPA failed to perform a necessary risk management step between the remedial investigation and feasibility study phases consistent with EPA guidance.

It was noted that EPA's chosen remedy did not reflect risk management principles and that risk management decisions and remedial cleanup levels should reflect specific uses at different portions of the Site. For example, no narrowing of COCs, pathways, media or receptors or refining of exposure assumptions was performed. It was further stated that EPA identified an unreasonable number of PRGs without consideration of the factors driving risk at the Site or what is achievable through a sediment remediation even though EPA develop RALs for a set of focused PRGs. Finally, one commenter stated

that although PRGs for the 1 x 10^{-4} and 1 x 10^{-5} risk levels were presented in Appendix B of the feasibility study report, no discussion of these PRGs was provided in the feasibility study report.

It was also noted that there is very little difference in residual risk estimates between Alternatives B and I for most COCs. Given the very conservative assumptions used to calculate PRGs, differences in estimated risks by a factor of 2 or less are not significant.

One commenter stated that EPA failed to make valid risk reduction decisions when evaluating and selecting a preferred alternative and has failed to accurately communicate to the resident fish-eating public regarding their ability to eat resident fish from the harbor once the remedy has been completed. EPA has not clearly disclosed the actual risk reduction that would be achieved if the preferred alternative were performed but instead has made inaccurate and confusing statements about the ability to eat fish following remedy implementation.

Another commenter stated that EPA failed to compare risk reduction for its preferred alternative to background risks. For example, a comparison of background (upstream) and Site smallmouth bass PCB concentrations shows that only a 2 or 3-fold decrease in Site-wide sediment concentrations is needed to reach equilibrium conditions. One commenter stated that it is important to provide context for considering the expected benefit of the alternative when evaluated in terms of the number of advisory fish meals following the cleanup relative to advisory fish meals due to background risk so the public can understand the actual anticipated benefits of EPA's action.

Regarding the magnitude of risk reduction, it was noted that there is little risk reduction between Alternatives B and I in EPA's feasibility study report and that if EPA's alternatives assessment was not otherwise flawed, Alternative B would properly be the "knee of the curve." The substantial increase in costs for minimal or insignificant risk reduction between Alternatives B and I is not acknowledged in EPA's feasibility study report or the proposed plan.

It was also noted that EPA's fish consumption risk calculations are not meaningful for evaluating protectiveness because none of the alternatives in the proposed plan will result in a material increase in the number of meals of resident fish from Portland Harbor that are safe to eat. The risk assumed from eating resident fish in the Harbor is calculated based on 228 meals per year for the subsistence fisher model and up to 78 meals per year for the recreational fisher model. The assumed improvement in fish consumption-related risk for all alternatives ranges from 2 meals to 10 meals per year. This number of additional meals is within the error band of the analysis, and is essentially meaningless when EPA's goal for unlimited consumption, without fish consumption advisories, is 78 to 228 meals per year. It was further noted that there is no obvious reason to prefer Alternative I (7 years of 0.6 fish meals to achieve 5 fish meals per year) to Alternative B (4 years at 0.6 to achieve 3 per year) or, for that matter, to Alternative G (19 years at 0.6 to achieve 10 per year). EPA's preference seems wholly arbitrary.

Another commenter stated that EPA has given no indication that it has similarly considered the benefits from eating fish in establishing its very conservative "fish meals per 10 years" amounts.

Another commenter noted that EPA stated in the feasibility study report that "the existing advisories might not be sufficiently effective in protecting human health since the current recommended rate of one meal per month [12 meals/year] for the general population may not be sufficiently protective of consumers." They further commented that EPA should consider that the conflict between the Oregon Health Authority advisory and EPA's BHHRA (Kennedy/Jenks 2013) indicates EPA's risk estimates may be incorrect. At a minimum, EPA should coordinate with Oregon Health Authority to provide clear,

credible, and consistent public health information. EPA should also explain its advisory in light of the U.S. Food and Drug Administration's threshold for PCBs in fish sold in supermarkets of 2 parts per million, which is more than 1,000 times higher than EPA 's cleanup goal of 0.3 parts per billion (ppb) in resident fish tissue.

Several commenters referred to risk management in the context of the NCP and EPA guidance. For example, it was noted that risk management in the Superfund program requires consideration of the advantages and disadvantages of cleanup alternatives and a balancing of trade-offs. As noted in the NCP preamble, the likelihood of exposure actually occurring should be considered when deciding the appropriate level of remediation to the degree that this likelihood can be determined. In addition, it was noted that EPA's 2005 Sediment guidance, states that a risk management process should be used to select a remedy designed to reduce the key human and ecological risk effectively. Finally, it was noted that it was telling that the phrase risk management is never used in the feasibility study report or the proposed plan.

Finally, it was noted that EPA's chosen remedy is not based on risk reduction/risk management principles. EPA notes that fish consumption is the major contributor to human health risk but does not consider the probability that dredging remedies will result in an increase in fish tissue concentrations for years during and after the completion of any remedy. The risk of releases during dredging is clearly present despite us of BMPs due to the large volume of dredging, duration (7) and high production rates assumed in the feasibility study report.

EPA Response

EPA adequately applied risk management in its remedy selection process given site-specific circumstances and information. Risk management is not done at one point in the process and generally is not given its own section in a feasibility study report or other decision document. One of the 11 principles for managing contaminated sediment sites is to select site-specific, project-specific and sediment-specific risk management approaches that will achieve risk-based goals. EPA has complied with this principle at the Site by focusing the cleanup on those areas that have the highest levels of toxic and persistent contaminants and whose cleanup will have the most impact on reducing risks to human health and the environment. EPA believes the best cleanup approach is one that sufficiently reduces risk in the areas where contamination is highest to allow for MNR to achieve cleanup levels in a reasonable time frame. The alternatives evaluated in the feasibility study report (USEPA 2016b) relied on ICs, MNR, ENR, containment, treatment, removal and disposal to varying degrees.

Some examples of how risk management was applied at the Site are discussed below. The baseline human health and ecological risk assessments identified 110 contaminants that potentially posed unacceptable risk. As shown in Table 2.2-2a through e of the feasibility study report, EPA utilized risk management to select 64 COCs based on the results of the risk characterization. EPA further considered risk management through the selection of focused COCs for the purpose of conducting the feasibility study. As noted in Section 3.4.1.1 of the feasibility study report, focused COCs are those that the distribution encompasses the majority of the spatial extent of contaminants posing the majority of the risks as identified in the baseline risk assessments. Finally, focused COCs allowed more efficient evaluation of the contamination within the Site during the feasibility study, though of course PRGs govern the success of the final cleanup.

Remedial action levels selected for evaluation in the feasibility study were developed for each of the focused COCs by plotting surface sediment concentrations and the relationships between RAL

concentrations and resulting site-wide SWACs. "RAL curves") were developed by plotting acres remediated against the post remediation SWAC. This evaluation facilitated identification of the "knee of the curve" for the relationship between area and post remediation SWACs. The purpose of this evaluation is to optimize the remedial footprint by developing alternatives that target areas with the highest levels of contamination and utilize MNR throughout the remainder of the Site. This significant reliance on MNR to reduce risks across the vast majority of the Site in areas where contaminant concentrations – and thus the relative risk – are lower than within the SMAs is application of risk management.

Regarding the selection of PRGs, as was noted in the comments, EPA considered a range of risk-based PRGs. For example, risk-based PRGs for PCBs presented in Table B3-5 ranged from 0 to 60 µg/kg. However, the actual PRG for PCBs as presented in Table 2.2-5 is 9 µg/kg which is background based and greater than sediment PRGs based on a hazard index of 1. Unlike EPA's risk range of 1×10^{-4} to 1×10^{-6}, EPA does not use a risk range for non-cancer risks. As a result, EPA does not have the same flexibility to adjust the risk range as it does when evaluating cancer risk.

EPA disagrees that it failed to accurately communicate to the resident fish-eating public regarding their ability to eat resident fish from the harbor once the remedy has been completed and that EPA has not clearly disclosed the actual risk reduction that would be achieved if the preferred alternative were performed. For example, the proposed plan (USEPA 2016c) provided detailed information regarding the allowable number of fish meals per 10 years for a range of remedial alternatives and fish consumption exposure scenarios. The proposed plan notes that estimating the number of acceptable fish meals at the end of construction is not a precise calculation, but that such calculations are useful to allow for a comparison of the outcomes of the different alternatives.

Regarding a comparison of background (upstream) and Site smallmouth bass PCB concentrations, the proposed plan notes that Biota samples from within the Site exhibited greater concentrations for most contaminants than those seen in background biota samples that were collected from the upriver reaches and above Willamette Falls. However, the data are insufficient to compute defensible background concentrations for biota tissue.

Regarding consideration of the likelihood of exposure actually occurring when deciding the appropriate level of remediation, EPA notes that the exposure pathway that poses the greatest risk to human health is the fish consumption exposure pathway. Fish consumption is known to occur throughout the Site. As a result, it is appropriate to select and implement a sediment cleanup that focuses on this key exposure pathway. Regarding the risk of releases during dredging and the probability that dredging based remedies will result in an increase in fish tissue concentrations for years during and after the completion of any remedy, EPA acknowledges that some short-term effects are likely during implementation of the remedy even with the use of BMPs and other measures to reduce these impacts. The evaluation of short-term effectiveness considered explicitly in the feasibility study report. For example, the feasibility study report notes that Alternative B has the shortest construction duration and thus would have the least impact to the community, workers, and the environment during construction. Conversely, the Alternative G would have the longest construction duration and, thus, would have the most impact to the community, workers and the environment during construction.

Regarding consideration of the benefit associated with eating fish, this type of assessment is outside the scope of a risk assessment conducted under CERCLA.

Regarding fish consumption advisories issued by the Oregon Health Authority, EPA disagrees inconsistencies between the assumptions used in the HHRA and the criteria that Oregon Health Authority uses to establish fish advisories indicates that EPA's risk estimates are incorrect, rather they have different purposes and methodologies. Similarly, the U.S. Food and Drug Administration's threshold for PCBs in fish sold in supermarkets of 2 parts per million is not relevant due to differences in statutory purposes and requirements. However, EPA agrees that coordination with the Oregon Health Authority is required to provide clear, credible, and consistent public health information. Additional information regarding the use of risk management is provided in the response to LWG Dispute 1r (Appendix A of this document).

Additional information regarding the development of remedial cleanup levels is provided in the response to LSS Dispute Issue 11 (Appendix A of this document).

2.19.3 The Exposure Scenarios Are Too Conservative

Comment Summary

Several commenters stat that the exposure scenarios do not reflect realistic exposure frequencies for recreational beach users and fishers and, as a result, the PRGs are too conservative. It was stated that the Portland Harbor human health risk assessment was based on unrealistic assumptions about the habits of anglers who are the critical receptors, substantially overstates the actual risk and therefore calls into question all of EPA's risk management decisions for the Site. In addition, the unreasonable conservatism and questionable methodology extend to the development of SWACs and RALs.

It was noted that EPA's evaluation was inconsistent with the NCP because EPA did not consider the likelihood of reasonable maximum exposures actually occurring. The NCP preamble states that the likelihood of the exposure actually occurring should be considered when deciding the appropriate level of remediation to the degree that this likelihood can be determined. For example, EPA concluded that it is reasonable to assume someone's sole source of fish - up to 228 meals per year for subsistence fishers - is resident fish caught in the harbor - no anadromous fish, no fish caught elsewhere and no store-bought fish. EPA presents no evidence that any actual sub-population like this exists anywhere near Portland Harbor.

The commenter further stated that EPA's multiple conservative assumptions were then combined using a deterministic approach that does not account for variability and uncertainty in angler exposures. Consequently, EPA's risk estimates represent extremes that are not representative of the vast majority of Site anglers, and perhaps no member of the fishing population. It was noted that EPA's risk estimates fall at the extreme tails of the distributions of PCB cancer risk and non-cancer hazard (at or above the 99th percentile) and that even with these conservative assumptions, for approximately 90 percent of subsistence anglers and over 95 percent of recreational anglers, current cancer risks and non-cancer hazards are at or below EPA's interim targets of 10^{-4} (cancer) and hazard index of 10 (non-cancer).

One commenter stated that the risk assessment assumptions must bear some relationship to reality for them not to be arbitrary. If they are not realistic, EPA arbitrarily and capriciously replaces sound science with unrealistic assumptions, in violation of CERCLA and the APA. Region 10's failure to consider and incorporate current data, and its multiple unrealistic exposure assumptions are well beyond "protective" and do not result in the accurate estimation of potential risks in Portland Harbor. The use of unrealistic data constitutes arbitrary and capricious agency action. As a consequence, the risk assessment information does not provide realistic information upon which to evaluate remedial

alternatives and to base remedial decisions, and EPA's risk assessment therefore does not satisfy NCP requirements.

The commenter also stated that EPA used assumptions that are unrealistic with respect to the habits of anglers who are the critical receptors, which results in the further overstatement of the actual site risk. EPA also did not follow its own 2013 BHHRA (Kennedy/Jenks 2013) in several important aspects of remedy selection, changing without explanations several key exposure assumptions that almost certainly resulted in additional overstatement of actual risk.

Despite selecting a remedy to address fish consumption risk, EPA acknowledges that its BHHRA risk scenarios contain uncertainty in the assumptions made regarding angler practices and behaviors, such as the amount of whole uncooked fish consumed and the proportion of resident vs. migratory fish consumed. in the absence of accurate information about angler behaviors, EPA relied on multiple conservative (worst case) and unsupported reasonable maximum exposure assumptions that have resulted in flawed PRGs for fish consumption (RAO 2). For example, EPA assumed: 99th percentile fish consumption rates (up to 281 meals per year) and exposure durations; resident species comprise all of the subsistence and recreational angler diets and half of the tribal angler diet; 100 percent of consumed fish come from the Study Area; and no contaminant loss due to cooking and preparation (such as filleting). These multiple conservative assumptions were then combined using a deterministic approach that does not account for variability and uncertainty in angler exposures. Consequently, EPA's risk estimates represent extremes that are not representative of the vast majority of anglers using the Site, and perhaps no member of the fishing population. If additional, realistic exposure assumptions are taken into account and applied to a scientifically valid probabilistic model, risks for the majority of the anglers are currently at or below EPA's interim targets (cancer risk of 1×10^{-4} and non-cancer hazard index of 1).

The hypothetical fisher is assumed to eat nothing but resident fish from the Willamette River. The fisher does not eat salmon or other anadromous fish, does not catch and consume fish from outside the Site and does not consume store bought fish. In addition, EPA does not take into consideration key uncertainties such as preparation and cooking methods.

It was specifically noted that the PRG for cPAHs is based on exposure scenarios that are unrealistic and overly conservative. The exposure scenarios do not reflect realistic exposure frequencies. For example, recreational beach exposure frequency of 94 days per year is based on best professional judgement. In contrast, the Lower Duwamish Waterway used an exposure frequency of 64 days per year based on a King County survey that was considered an overestimate because it was based on beaches with greater amenities than the Lower Duwamish Waterway. Similarly, the tribal direct contact exposure scenario is overly conservative. EPA adopted the assumption that a person would fish at the Site for 260 days per year for 70 years and during every single visit would cover his or her hands and forearms with sediment when pulling up fishing lines or anchors. The commenter stated that these assumptions are not supported by information presented in the remedial investigation report (USEPA 2016a).

In addition, it was noted that EPA’s approach improperly assumes that direct contact with sediment may occur everywhere in Portland Harbor without consideration to variations in land uses, site conditions and public access. Several commenters stated that EPA should rely on current and future site uses and security protocols, which prevent direct contact risks to human health. The ROD should reflect the realistic risk of direct contact with contaminated sediments and based risk-management decisions on that reality. Risks from direct contact with sediment do not exist in places that people cannot access. In addition, it was noted that for the recreational fisher, EPA has assumed that anglers spend all of their

time fishing in a one-mile segment of the river. Many locations along the river are not accessible to the public except by boat; whether by boat or from the shoreline, it is highly improbable that someone catches 80 fish meals per year for 30 years from the same location.

Regarding ecological risk, it was noted that ecological risk is managed on a population, not individual, basis. So even if a home range is within a river mile, the contiguous population is exposed over a larger area, and, therefore, post-construction risks should be evaluated on a site-wide basis. Overall, the commenters stated that the risk assessment assumptions are not merely conservative but wholly unrealistic and contrary to the "conservative but within a realistic range of exposure scenarios" recommended by the NCP.

EPA Response

The exposure scenarios evaluated in the baseline human health and ecological risk assessments are based on a reasonable maximum exposure scenario consistent with EPA guidance. As described in the BHHRA (Kennedy/Jenks 2013), fish consumption rates from published studies were used to describe the range of reasonably expected exposures relevant to the different populations known to occur in the Portland Harbor area. Three different rates were evaluated: 17.5 grams per day (approximately 2 eight ounce meals per month), 49 grams per day (approximately 6.5 eight ounce meals per month), and 142 grams per day (19 eight ounce meals per month). The fish consumption rate of 17.5 grams per day is considered representative of a central tendency value for recreational fishers, and 49 grams per day was selected as the reasonable maximum exposures value representing the higher-end consumption practices of recreational fishers. The consumption rate of 142 grams per day represents a reasonable maximum exposures value for high levels of fish consuming, or subsistence, fishers. The rates of 17.5 grams per day and 142 grams per day represent the 90th and 99th percentiles, respectively, of per capita consumption of uncooked freshwater/estuarine finfish and shellfish by individuals (consumers and non-consumers) 18 or older, as reported in the Continuing Survey of Food Intakes by Individuals (CSFII) and described in EPA's Estimated Per Capita Fish Consumption in the United States (USEPA 2002). The consumption rate of 49 grams per day is from a creel study conducted in the Columbia Slough (Adolfson 1996), and represents the 95 percent upper confidence limit on the mean, where 50 percent of the mass of the total fish is consumed (Adolfson 1996). The above cited fish consumption rates are considered "conservative but within a realistic range of exposure scenarios" as recommended by the NCP. Further, as evidenced by public comments submitted by the six Tribes, they believe even the 142 grams per day consumption rate to be a low end exposure value for tribal consumption.

EPA disagrees with the contention that EPA's evaluation was inconsistent with the NCP because EPA did not consider the likelihood of reasonable maximum exposures actually occurring consistent with the NCP preamble. As noted above, a consumption rate of 49 grams per day was used to evaluate risk on a river mile and SDU basis. This rate was based on a creel study conducted in the Columbia Slough and thus represents exposures that are "actually occurring" in the vicinity of the Site. Similarly, the consumption rate of 142 grams per day is lower than the fish consumption rate of 175 grams per day which was based on a study of fish consumption behaviors by tribal consumers in the Columbia River basin and was used by the State of Oregon to establish water quality standards for the protection of human health.

For the reasons cited above, EPA disagrees that the risk assessment information does not provide realistic information upon which to evaluate remedial alternatives and to base remedial decisions. Thus, EPA's risk assessment fully satisfies NCP requirements.

EPA acknowledges that its risk assessment was based on a deterministic approach but notes that deterministic risk assessments are the prevalent approach for assessing risk to human health in accordance with EPA's risk assessment guidance and that the deterministic risk assessment approach was initiated by the PRPs.

EPA also disagrees that ecological risk was incorrectly evaluated. Risks to wildlife were evaluated on a river mile or SDU basis. This closely corresponds with key wildlife receptors at the Site such as mink and osprey. EPA believes that this is the appropriate scale over which to evaluate post construction risk to wildlife rather than on a site-wide basis.

EPA acknowledges that as described in the BHHRA, the exposure scenario includes a factor of 25 percent was used to account for the time spent fishing in a single area within the Study Area, which again may be a low-end estimate given that people living and fishing on river beaches, such as Willamette Cove. The 25 percent site-use factor was not used in the development of PRGs because the site-use factor applies to different areas within the Site as opposed to areas outside the Site.

The basis for not applying the site-use factor to the development of cleanup levels is described in the response to LWG Dispute Issue 1d (Appendix A of this document).

The commenters misstated the approach used to assess direct contact risk in the feasibility study report (USEPA 2016b). Cancer risks for RAO 1 were calculated using the rolling river mile concentrations averaged on a 0.5-mile scale and the sediment PRGs for each COC based on a 1×10^{-6} cancer risk. As noted in Appendix J of the feasibility study report, direct contact with sediment in the navigation channel segment was not evaluated for this RAO. In addition, the evaluation of direct contact human health risk presented in Appendix J only considered direct contact with sediment and did not consider beach exposures.

For further response on the assumptions on fish consumption see EPA response to LWG Dispute Issue 1r (Appendix A of this document).

2.19.4 Risk Evaluation Is Inconsistent with Risk Assessment

Comment Summary

Many commenters noted that the PRGs and evaluation of post construction risk presented in the feasibility study report were inconsistent with the procedures used in the baseline human health and ecological risk assessments. Post-construction risk evaluation assumes different exposure scenarios and spatial scales than the baseline risk assessments.

It was noted that EPA's post-construction risk estimates alter exposure scenarios and spatial scales and use inappropriate PRGs to inflate the perceived benefit of more aggressive actions. For example, For RAO 2, human health fish consumption risks, EPA generated post-construction SWACs for a range of spatial scales. However, in EPA-approved BHHRA (Kennedy/Jenks 2013), risks were evaluated by whole river miles with no longitudinal splitting. Similarly, for RAO 6, ecological bioaccumulation risks, feasibility study SWACs were generated on a rolling 1-river mile basis with longitudinal splitting and on an SDU scale. The PRGs for the various RAO 6 chemicals are based on different ecological receptors evaluated in the BERA (Windward 2013). Due differences in exposure parameters cannot be estimated by applying a "one size fits all" spatial scale to every PRG. Further, none of the BERA appropriate spatial scales are consistent with longitudinally split river miles or SDUs. Similarly, the DDE PRG is based on the BERA spotted sandpiper dietary assessment that was evaluated on a 2-river mile scale of beach sediment which differs from the feasibility study evaluation spatial scales

In addition, the risk reduction methodology presented in Appendix J glosses over many detail, thus it is not possible to fully comment on EPA's methodology. However, it is clear that many aspects were inconsistent with the baseline risk assessments. To accurately evaluate the alternatives, an accurate assessment of risk must be completed using the methods presented in the BHHRA and BERA.

It was also noted that the spatial techniques used to evaluate risk reduction in the feasibility study report are duplicative, confusing and overly complicated and do not accurately represent potential exposures. New methods were used to evaluate risk reduction and different data averaging methods and assumptions were used to develop SWACs. For example, site-wide post construction risk estimates were based on estimating a site-wide SWAC as 95 percent UCL of the SDU specific SWACs and then calculating risks based on an ingestion rate of 142 grams per day.

Finally, it was noted that the evaluation of risk reduction associated with bioaccumulation pathways in the feasibility study report assumed linearity in the food web model which is not accurate.

EPA Response

EPA disagrees that the spatial scales evaluated in the feasibility study report (USEPA 2016b) are inconsistent with the baseline human health and ecological risk assessments. See the response to LSS Dispute Issue 9 (Appendix A of this document).

EPA has revised the applicable tables in the feasibility study report Appendix J. These are presented in the supplemental information for the ROD (Appendix IV).

2.19.5 Evaluation of Dioxins and Furans Is Inconsistent with Risk Assessment

Comment Summary

It was noted that the risk estimates and remedy development for dioxin furans was flawed because EPA did not assess dioxins/furans as 2,3,7,8-TCDD equivalents as was done in the BHHRA (Kennedy/Jenks 2013). This resulted in a significant disconnect between the BHHRA and post-construction risks for dioxins/furans for RAO 2. For example, for a breastfeeding infant, the highest HQ for dioxin/furan toxicity equivalence quotients calculated in the BHHRA are 10 on a site-wide basis (tribal fish consumption, whole body) and 10 on a river mile basis (recreational reasonable maximum exposure consumption). However, Table J2.3-1a indicates that the site-wide HQ for the same infant scenario is 785, almost two orders of magnitude higher. Similarly, for a child, the highest HQ for dioxin/furan toxicity equivalence quotients calculated in the BHHRA are 10 on a site-wide basis (tribal fish consumption, whole body) and 10 on a river mile basis (recreational reasonable maximum exposure consumption). However, Table J2.3-1a indicates that the site-wide HQ for the same scenario shows a site-wide HQ for HxCDF alone.

In addition, it was noted that EPA acknowledged the inadequacy of the HxCDF data in terms of quality and spatial coverage in the remedial investigation. Because EPA developed PRGs and RALS based on data characterized as inadequate, EPA abrogated its duty to produce scientifically sound and supportable risk estimates as well as cleanup criteria in the form of supportable PRGs and RALs. Finally, was noted that the approach for identifying which dioxin congeners to evaluate is unclear.

EPA Response

EPA acknowledges that the evaluation of dioxins and furans in the feasibility study report (USEPA 2016b) differed from the evaluation in the BHHRA (Kennedy/Jenks 2013). However, the difference was fully explained in the feasibility study report in Appendix J. In the BHHRA, the risk associated with

exposure to dioxin and furans was evaluated as 2,3,7,8-TCDD equivalents (Dioxin toxicity equivalence quotients). However, it was not possible to develop risk-based PRG and background concentrations for dioxin toxicity equivalence quotients. Risk-based PRGs for dioxins and furan were calculated using the food web model which requires consideration of individual dioxin furan congeners with specific physiochemical properties. In addition, due to variations in the upstream composition of dioxin and furan congeners, developing background estimates for dioxin toxicity equivalence quotients was not considered technically valid.

The evaluation of risk reduction in the feasibility study report was conducted by estimating the post construction sediment concentration, estimating the fish tissue concentration through the food web model and estimating the residual risk based on a comparison to PRGs. As a result, the methodology is not directly comparable to the procedures used in the HHRA which estimated dioxin risk based on measured rather than modeled fish tissue concentrations. However, use of the food web model is required for the evaluation of post construction residual risk for Alternatives B, D, E, F, F Modified, G and I. It therefore appropriate to estimate the risk associated with the no action alternative, Alternative A, using the same methodology even though it does not provide the same results as the HHRA.

The approach for identifying the dioxin congeners that were selected for evaluation in the feasibility study is described in a December 23, 2014 memo from CDM Smith to EPA (AR Doc #10010497). The identification of the dioxin congeners for evaluation was based on identification of the dioxin congeners that pose the greatest risk to human health based on their concentration is smallmouth bass fish tissue collected during Round 3 of the Portland Harbor remedial investigation. Based on this evaluation, it was determined that 5 congeners contribute 85 percent of the risk (1,2,3,4,7,8-hexachlorodibenzofuran [HxCDF]; 1,2,3,7,8-pentachlorodibenzo-p-dioxin [PeCDD]; 2,3,4,7,8-pentachlorodibenzofuran [PeCDF]; 2,3,7,8-tetrachlorodibenzo-p-dioxin [TCDD] and 2,3,7,8-tetrachlorodibenzofuran [TCDF]. As described in Appendix D of the feasibility study report, the footprints for the 1,2,3,4,7,8-HxCDF and 2,3,7,8-TCDF RALs were determined to be covered by the footprints of the other three dioxin/furan congeners. Thus, the dioxin/furan congeners retained as focused COCs were 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, and 2,3,4,7,8-PeCDF.

2.19.6 Evaluation of Risk Should Consider Specific Factors

Comment Summary

It was further noted that risks vary according to site use and much of the Site is currently designated for industrial uses that provide limited or no access to recreational users. As a result, multiple PRGs should be established based on site-specific uses and conditions as done for the Lower Duwamish Waterway Site

The BHHRA (Kennedy/Jenks 2013) evaluated generic exposure scenarios used to evaluate risk to humans from contaminants. The only human exposure scenario driving EPA's proposed clean-up of PAHs at T4 is direct contact with sediment. Because there is no public beach access at T4, the only possible direct contact is from the water. In its most conservative fishing scenario, EPA assumed that a person would fish at Terminal 4 for 260 days per year for 70 years and during every single visit would cover his or her hands and forearms with sediment and ingest sediment when pulling up fishing lines or anchors.

EPA must adjust its Harbor-wide approach to direct contact human health risk and make risk management decisions based on site-specific considerations. Basing remedy selection on an assumption that direct contact with sediment is possible everywhere without consideration of variations in

conditions and land use leads to a T3 cleanup requirement that is unsupported by the facts and unrelated to real risk reduction.

It was noted that at the Terminal 4 site, current and future marine terminal make fishing (and beach access from fishing boats highly improbable. With extremely large ocean going vessels moving in and out every few days, navigation safety for fishing boats is an issue. In addition, the Port maintains a dedicated security operation and Facility Security Plan developed and implemented pursuant to Coast Guard regulations. As a result, fishing in the off-channel slips and bays at Terminal 4 consists of isolated *de minimis* instances and does not pose risk to human health. The Port noted that these site management and security protocols constitute governmental controls which EPA can recognize as existing ICs. The Port would be willing to discuss additional ICs with to ensure protectiveness that could be trigger upon future changes to site use.

One commenter stated that EPA continued to exclude use of a site-use factor for the evaluation of direct contact risk in the BHHRA. The commenter stated that use of a site-use factor of 25 percent would change the current RAO 1 PRG for carcinogenic PAHs measured as BaPEq from 106 to 424 µg/kg. The commenter further noted that not even alternative G meets the current BaPEq PRG for many half river miles but that if the site-use factor is accurately applied, a BaPEq PRG of 424 results and can be achieved by alternative A for all but a few half river mile areas.

EPA Response

EPA disagrees that it did not consider Site specific factors when developing cleanup goals. For example, direct contact exposures were not assumed to occur within the navigation channel. Due to potential changes in future land and waterway uses, the recreational use of the river, and inappropriate reliance on ICs (security controls), EPA did not take into account shipping and security controls during the evaluation of risk or in the development of remedial action alternatives. It should be noted that while the Portland Harbor Site is designated for industrial uses, it also serves as a resource for recreational and subsistence fishing. Regarding the development of location specific remedial cleanup levels as was done for the Lower Duwamish Waterway Site, EPA notes that location specific PRGs have been developed for PAHs. For example, PRGs for RAO 2 apply throughout the Site while PRGs for RAO 1 only apply to nearshore areas.

2.19.7 Alternative I Fails to Meet Several Superfund Criteria

Comment Summary

One commenter stated that EPA's selected remedy did not meet certain evaluation criteria. Specifically:

- Criteria 1 (overall protection of human health and the environment. Alternative I's failure to meet Threshold Evaluation Criteria 1 (overall protection of the human environment), should have been cause for eliminating Alternative I right from the start.
- Criteria 3 and 5: Based on its failure to meet Balancing Evaluation Criteria 3 (Long-term Effectiveness) and Criteria 5 (Short-term Effectiveness) EPA should have shifted to a more aggressive alternative.
- Criteria 9: Based on the failure to meet Modifying Evaluation Criteria 9 (Public Acceptance), EPA should take a hard look at why after 16 years EPA has failed so profoundly to meet the needs of our community and take the time necessary to select a remedy that will meet our community's needs and the requirements of the law.

EPA Response

EPA disagrees that EPA's selected remedy did not meet the NCP evaluation criteria. Through active remediation, natural recovery and ICs, EPA's selected remedy is considered protective. To increase the confidence in the remedy's ability to meet the threshold criterion of (overall protection of human health and the environment, EPA has selected Alternative F with modifications in the ROD.

EPA also disagrees that it did not fully consider the balancing criteria of Long-term Effectiveness and Short-term Effectiveness. As described in Section 4.1.5 of the feasibility study report (USEPA 2016b), the evaluation of long-term effectiveness and permanence considered the magnitude of residual risk based on each of the RAOs and the adequacy and reliability of ICs. Similarly, the evaluation of short-term effectiveness considered the time needed to implement the remedy and any adverse impacts that may be posed to the community, workers, and the environment

Finally, EPA disagrees that its remedy does not consider the public acceptance. As noted in the ROD, EPA held numerous outreach events and extended the public comment period by 30 days. As noted elsewhere, EPA believes that its proposed remedy fully complies with the requirements specified in CERCLA and the NCP.

2.19.8 Address Miscellaneous Risk Issues

Comment Summary

Several other comments relating to risk were received, and are summarized below:

- Post construction risks are only estimated for post construction conditions and not any other timeframe. Because of the reliance on MNR, the lack of a post-construction risk estimate process for time intervals post construction makes the usefulness of the post construction risk estimates limited.
- Risk reduction was not accurately presented. The combination of the use of zero as replacement values and the lack of incorporation of estimates of MNR/ENR in any of the remedies overestimates risks from remedies that include more capping and MNR/ENR and under estimates risk for removal technologies due to the generation of residuals.
- Some of the risk-based PRGs reported by EPA are much less than background estimates either as calculated by EPA or LWG and that because these PRGs are unachievable, the post construction risk estimates are meaningless.
- Due to the contribution of COCs from upstream due to background conditions, the target risk range should have been set between 1×10^{-4} and 1×10^{-5}.
- The feasibility study and proposed plan did not consider upstream fish tissue concentrations – either measured or predicted – relative to site concentrations to assist in the development of cleanup levels
- The fish meals/10 years was not used in the BHHRA (Kennedy/Jenks 2013) and no basis was provided for this new unit and some tables presented in Appendix J are include cPAHs and some do not.
- EPA assigned a shellfish consumption PRG to the navigation channel even though no shellfish harvesting can occur in the navigation channel.

- Several commenters noted that the risk associated with background levels of mercury was not considered. The risks associated with mercury in fish tissue and the background (based on up-river conditions) and equilibrium-based concentrations of PCBs (based on ongoing loads from the urban watershed) should be stated as a practical limit on the future remediation activity's ability to materially change the fish consumption risks for those who eat fish from the Site.
- A fisher survey should be conducted to gather information on the number of persons actually fishing in the Lower Willamette River and their type and frequency of fishing activities.
- A probabilistic risk framework is appropriate for this complex Site and would provide an assessment of who is or is not at risk from consumption of fish or other exposures at the Site. ExxonMobil prepared a probabilistic risk assessment to provide information on realistic risks at the Site and risk reduction that could be achieved by the remedial alternatives being considered by EPA.
- Residual risk estimates were presented in Appendix J of the feasibility study report. Several commenters noted errors in the calculations and that the calculations could not be reproduced. For example, it was noted that some of the tables in Appendix J include arsenic, aldrin, chlordanes, and dieldrin and the dioxin/furan congeners 2,3,7,8-TCOF, 2,3,4,7,8-PeCOF, and 1,2,3,4,7,8-HxCDD in addition to PCBs, ODx, and 2,3,7,8-TCDD. While others are missing cPAHs (such as Table J2.3-1a).

EPA Response

Regarding the development of post construction risk estimates that consider MNR, EPA disagrees with the assertion that the feasibility study report lacked a process for considering risk reduction post-construction. The decision documents clearly state that multiple lines of evidence indicate that natural recovery of contaminant concentrations is occurring and is anticipated to occur in the future, particularly following upland source control and active remediation of the most-heavily contaminated portions of the sediment bed. That projected recovery is the fundamental premise for slating large areas of low level contamination for natural recovery instead of active remediation. However, EPA does not believe that quantitative predictions from models that cannot reasonably be expected to be quantitatively accurate should be relied upon for decision making. Indeed, reliance on such analyses is potentially misleading, especially in highly dynamic and heterogeneous environments that do not lend themselves to long-term quantitative predictions. In lieu of a reliance on model output, the post-construction timeframe includes monitoring to measure the extent of natural recovery and attainment of remedial cleanup levels and RAOs. If progress or attainment of goals is not sufficient, additional remediation will occur based on outcomes of the five-year review process. Overall, EPA determined that evaluating alternatives based on estimated post construction concentrations without incorporating quantitative, but inaccurate, natural recovery predictions was more appropriate for remedial decision making. Post construction sediment concentrations were assumed to be zero in active remediation areas because active remediation incorporates clean material in residual management layers, backfill, and caps, so the use of zero as a replacement value was considered appropriate.

The fact that risk-based PRGs are below background is irrelevant because risk-based thresholds below background were not selected as PRGs; rather the background concentration was utilized. However, when estimating residual risk, EPA compared post-construction sediment concentrations to risk-based PRGs as described in Appendix J rather than running the post-construction sediment concentrations through the food web model. While this imparts a certain amount of uncertainty for bioaccumulation

pathways (RAOs 2 and 6) due to the non-linearity of the food web model, this approach is considered appropriate for a feasibility study level evaluation.

It was noted that due to the contribution of COCs from upstream due to background conditions, the target risk range should have been set between 1×10^{-4} and 1×10^{-5}. EPA notes that in many instances, the resulting residual risk estimate presented in Appendix J falls within this range (See Table J2.3-3f).

Regarding the use of upstream fish tissue concentrations to assist in the development of cleanup levels, because the focus is remediation sediments, background based PRGs were developed only for sediment.

Regarding the use of fish meals per 10 years as a metric for evaluating risk reduction in the feasibility study, please see the response to LSS Dispute Issue 8 (Appendix A of this document).

Regarding the evaluation of the risk associated with shellfish consumption in the navigation channel, there is no information to suggest that shellfish harvesting *cannot* occur in the navigation channel.

EPA acknowledges that background levels of mercury within the Willamette watershed may exceed acceptable levels. However, that does not obviate the need to address the risks associated with releases of hazardous substances at Portland Harbor such as but not limited to: PCBs, dioxins and furans, DDx and PAHs. Comments stated that background levels of mercury may continue to pose risk due to up-river sources that should be evaluated. Consistent with EPA's background policy, the risk assessment evaluated risks associated with mercury and addressed site-specific background issues in the risk characterization. As noted in the background policy, cleanup levels are not set at concentrations below natural background levels under CERCLA.

Several comments stated that a fisher survey should be conducted to gather information on the number of persons actually fishing in the Lower Willamette River and their type and frequency of fishing activities, EPA notes that a creel survey based on Columbia Slough fishers was used to establish the reasonable maximum exposure fish consumption rate for recreational fishers.

Several commenters have noted errors in the residual risk estimates provided in Appendix J. However, without additional information, it is not possible to determine whether the errors are actual or not.

2.19.9 Address Seismic Issues

Comment Summary

Twenty-seven comments were received that cited earthquakes as a major concern related to EPA's preferred alternative. Almost all were individual, personal comments. Some comments said that the remedy did not meet the criteria for long-term effectiveness and permanence. The general focus was mainly on contaminants being released to the river in times of crisis. The sources of that contamination were varied and included capped and uncapped river bottom sediments, upland soils, the CDF, and tank farms (not associated with the remedy). Cooperation in planning was also requested as were tsunamis.

Representative comments include:

- "The Proposed Alternative I does not meet the criteria for long-term effectiveness. Burying contaminants in the river bottom has short-term benefits, but it leaves open the risk that any major event, earthquake, flood, or even a ship turning the wrong way, will disturb the cover material and release the contaminants back into the river system. "

- "As EPA well knows, the Pacific Northwest is overdue for a massive earthquake. This will provide ample opportunity for the debris on the bottom of the river to migrate, and, if EPA is short-sighted enough to cap the toxic debris within the river itself and then assume the cap will withstand the earthquake without breaking free and recontaminating the river, I believe you are sorely wrong. "
- "The Cleanup Plan makes no mention of the fact that a subduction zone earthquake will occur and effects to the Portland area will be great. We don't know the timing of this event, so any cleanup should address the issue. This region will have plenty of issues to deal with after the quake, we don't need to worry about recontamination of the river with sludge from a confined disposal facility. Any upland disposal site chosen should also be protected from remobilization of the sludge during an earthquake. "
- "My primary concern about the in-river disposal facility is the lack of seismic protection. If the Cascadia earthquake hits a non-seismically protected disposal facility full of contaminated sediment, it will be right back in the river. At that point, why did we even spend money on it in the first place? I recognize the limitations to shipping it off site - the trucks from Portland Harbor would be going right by my house. However, where ever we put the sediment, it needs to be protected from the largest possible earthquake we are expecting from the Cascadia subduction zone. Despite the large amount of other contaminants that are going to be dumped in the river during a large earthquake (namely gas fields, industrial waste held shore-side, etc. etc.), to meet EPA requirements of developing the executing the most cost-effective project, we need to make sure that contaminated sediment, wherever it is located, is seismically protected in the case of a worst-case-scenario earthquake. "
- "Please allow me to emphasize particular points:
    - I am concerned about the impact of the anticipated tsunami earthquake which will in all probability, occur during cleanup and restoration of the Superfund site at least somewhere on the river. Has this been adequately addressed?
    - The consequences of disturbed pools of pollution and toxins. What about the instability and certainty of liquefactions of soils bearing the Northwest tank farm? In my opinion this area in anticipation of the quote should be stabilized (if possible) or the tank relocated as part of superfund operations or at least in conjunction with the latter. "
- "There is no mention of the risk of seismic activity or significant flooding that would stir up the river bed. No one knows what a massive earthquake would actually do, but we know the risk of a deep subduction earthquake within the next 50 years is estimated to be about 50 percent. All that contaminated sediment could be stirred up and added to the mix of other toxins that would add significant danger to recovery efforts after a quake. "
- "The City request that EPA work with the Federal Emergency Management Agency, the City, and other local government agencies to include all appropriate measures in the ROD and RD/RA to address recontamination risks associated with a catastrophic earthquake. In addition to remedy selection, design and action, the City request that the fuel tank farms within the Site be evaluated as a potential source of recontamination in the event of an earthquake. After we have invested

hundreds of millions of dollars in this cleanup, we want to make sure that we do everything in our power to keep it clean."

- "Many of these tanks are very old, and are in dire need of updating, and/or replacement. It has been well-documented that the soils on the west side of the river consist largely of fill material, and that these soils would liquefy with a significant earthquake event. We urge the US EPA to include language that identifies the issue, and makes a commitment to work on it outside of the Superfund process. EPA has an opportunity to assist the State of Oregon, the City of Portland and others to develop an action plan to reduce the risk to the river from these tanks from a significant earthquake event."

EPA Response

For areas to be capped, the feasibility study considered sediment bed slope as a factor in determining the favorability of this technology, which is an indirect consideration of seismic stability. The feasibility study assumes that capping on slopes less than 15 percent does not require special considerations. Slopes of 15 to 30 percent require special considerations that warrant a more engineered design and will be given further consideration of key details during design, such as geotechnical data to be collected, which may restrict capping areas or otherwise change the design in the context of an earthquake. Caps were not considered on slopes greater than 30 percent. For those areas carried forward in the ROD for capping, impacts from large earthquakes will also be considered in remedial design, including distance from active faults, maximum expected earthquake magnitude, probability of occurrence, physical properties of sediment and capping material, and slope. Slope stability on remediated river banks will also be a consideration during remedial design to ensure engineered caps are placed in a fashion that is protective of human health and the environment considers earthquake risk and extreme weather events.

In regards to the upriver tank farms, the Superfund program addresses spills which have already occurred and are uncontrolled releases into the environment. Releases from fuel farms and other petroleum storage facilities is regulated under Spill Prevention, Control, and Countermeasures and other regulations, which take into account threats such as earthquakes. EPA has previously and will continue to evaluate the potential of remedy recontamination from historical uncontrolled releases into the environment, but that does not include the potential future release of hazardous substances stored at or near Portland Harbor. EPA will work with local municipalities in ensuring that earthquake contingencies for the CERCLA remedy are part of the ICs implementation and assurance plan to be developed after the ROD.

2.19.10 Design for Climate Change

Comment Summary

Many comments very briefly referenced climate change as part of larger comments such as CDFs, upland sources, or the need to move quickly.

Three comments specifically addressed the need to account for climate change in designing the remedy:

- The proposed plan does not appear to consider long-term changes in climate, changes in river level, increased salinity, frequent storms, scouring, or the potential for flooding upland areas. It does not consider the potential impacts of catastrophic climate change.

- "The proposed plan does not account for the potential risks associated with climate change as required in Executive Order 13653 (November 1, 2013). Specifically, the feasibility study fails to

account for the potential for increasing frequency of floods due to climate change, including climate impacts from the Columbia River in the Portland Harbor study area, which are different and temporally offset from the impacts in the Willamette River itself. EPA's Climate Change Adaptation Technical Fact Sheet provides specific steps for addressing climate change for contaminated sediment remedies, including evaluation of vulnerabilities and identification of adaptation measures to provide additional resiliency15. Additional Site-specific scientific studies are also available. The City requests that EPA update its climate change evaluation to be more accurate and to develop a climate change adaptation plan for the cleanup."

- "EPA should account for the potential impacts of climate change on the efficacy of the remedy. It is unclear whether EPA has adequately accounted for the potential impacts of climate change on the efficacy of their proposed alternative or on the other alternatives that were considered. This is required under Executive Order 13653.15. The impacts of climate change are likely to have a profound impact on the Willamette River during the life of EPA's cleanup plan, all the more so given that it is far from certain when the cleanup goals will actually be achieved. This is likely to include increased flood events in terms of both frequency and volume. This could have profound implications for the efficacy of the remedy across the uplands, river banks and inwater environments. EPA should consult its own Climate Change Adaption Technical Fact Sheet as well as other tools that it has developed to incorporate the impacts of climate change into its Superfund Program (https://www.epa.gov/superfund/superfund-climate-change-adaptation)."

EPA Response

As described in Section 3.4.4 of the feasibility study report (USEPA 2016b), EPA considered climate change impacts on river flows in the Willamette watershed. Climate change is anticipated to result in an increase in winter flow and a decrease in summer flow, with an earlier peak flow. More high flow events are expected but of less magnitude than the large historical flood events. An assessment of the potential effects of increased river flows will be conducted during remedial design.

2.19.11 Manage Flood Rise

Comment Summary

Two comments were received that related to management of flood rise as part of the cleanup. The City of Portland provided a comment regarding EPA's plan to ensure that flood rise management complies with regulatory requirements throughout the Site. The City points out that it qualifies for federally-backed flood insurance and federal disaster assistance because it follows the floodplain standards of the National Flood Insurance Program. The City comment requests that EPA ensure that remedy selection and design adequately consider flood management and not impair the City's ability to maintain its qualification for its favorable status under the National Flood Insurance Program. As part of the flood rise management evaluation, the City requests that EPA use its definition of "no rise" to mean less than 0.005 feet of rise, such that the rise would be equal to 0.00 feet when rounded and reported to the hundredth of a foot. The comment states that the U.S. Federal Emergency Management Agency has concurred with this definition. The City points out that cut and fill amounts and location may change during remedial design based on Site-specific factors. Additionally, remedies are likely to be sequenced over several years in different areas of the river, with the potential to cause temporary flood rises. Hence, the City would like the ROD to describe how the evaluation (using the HEC-RAS model computer program) will be revised during individual project phases to assure that there are no cumulative effects of flood rise. The Audubon Society also provided a comment questioning whether the plan allows the

City to retain adequate flexibility to mitigate for future floodplain impacts in the North Reach of the Willamette unrelated to Superfund.

EPA Response

The Portland Harbor cleanup must comply with floodplain management executive orders and Federal Emergency Management Agency standards to not adversely affect floodplain capacity, which is a "no rise" standard. Executive Order 11988 on Floodplain Management requires federal agencies to document that actions they authorize in floodplains will not adversely affect floodplain capacity or cause floods to encroach upon new areas by increasing base flood elevations. During remedial design a floodplain impact study analyzing the effects of the selected remedy on flood characteristics, specifically base flood elevations, of the lower Willamette. This study will encompass the areas proposed for active remediation as well as adjacent upstream and downstream reaches that could potentially experience flood impacts resulting from the remedy selected in the ROD.

An assessment of impacts from the remedy will be conducted on identified Flood Hazard Areas. These analyses will provide documentation demonstrating that the cumulative effect of the remedy, when combined with all other existing and anticipated work, will not increase the water surface elevation of the base flood more than 1 foot at any point within the regulatory flood hazard area, and no rise (0.00-foot) in the base flood elevation within the defined regulatory floodway. These analyses will be certified by a professional engineer licensed in the State of Oregon.

An analysis was performed during the feasibility study and summarized in Appendix P of the feasibility study report (USEPA 2016b) comparing estimated volumes of capping and dredging for the various alternatives within each SDU as well as site-wide. Evaluated on a Site-wide scale, the volume of fill for each alternative is expected to be generally less than the total volume removed, resulting in a net cut volume. Evaluated on a SDU basis, the volume of fill for each alternative is less than the total volume removed for most the SDUs. EPA acknowledges that this analysis is not the final analysis to meet the requirements of Executive Order 11988 and a more detailed analysis will be required during remedial design based on regulatory, existing and proposed site-specific factors.

A comment was also received from the Audubon Society inquiring whether the plan allows the City to retain adequate flexibility to mitigate for future floodplain impacts in the North Reach of the Willamette unrelated to Superfund. The comment is not clear as to what kind of mitigation is being referred to (flood mitigation or ecological/habitat mitigation). Assuming the question is will the remedy affect the ability to implement habitat mitigation that could be required by industrial development in the floodplain to address possible adverse impacts to wetlands, riparian woodland and/or avian habitat then the answer is no, if the mitigation is not planned for areas identified for remediation. Any habitat mitigation planned for regulatory floodplain/floodway areas of the Willamette River fall under the same regulations as the Portland Harbor remedy ARARs (Executive Order 11988) and would require local floodplain permitting. EPA believes there is no reason why either flood or habitat mitigation would be restricted by the remedy as any restriction would be regulation-based.

2.20 Short-term Effectiveness

2.20.1 Address Inadequate Evaluation of Short-Term Effectiveness

Comment Summary

Comments on short-term effectiveness were received from the multiple businesses, Portland Audubon Society, the Portland Water Conservation District, West Multnomah Soil and Water Conservation District, and Associated Oregon Industries. The comments expressed concerns that the short-term

effectiveness evaluation was inadequate due to lack of quantitative analysis, detail and/or missing components such as logistics. Commenters requested additional analysis of several short-term impacts per NCP guidance. LWG called short-term impact mitigation measures biased and dismissive of short-term impacts, and commented that these measures misleadingly suggested short-term impacts are inconsequential. TMG and BAE commented, "… [the] proposed plan's brief discussion of remedy effectiveness and implementability provides no substantive explanations for its comparison between remedial alternatives, instead stating broadly that *'the potential for technical problems and schedule delays increases in direct proportion to the duration, amount of active remedy.' [Id.,* p. 57]" ARCO and BP West Coast Products commented that short-term impacts increase proportionately as the remediation footprint decreases.

Commenters did not feel that the risk associated with disturbance of sediment during dredging and capping was well addressed:

- The PCI Group commented that EPA did not consider that larger footprint remedies cause greater suspension of contamination and disruption to Portland communities.
- West Multnomah Soil & Water Conservation District asked if "there is risk of increased toxicity of contaminants due to removal from the river, or risk of atmospheric exposure to contaminants[,] … how EPA plans to mitigate this risk," and how this was considered in Alternative I selection as preferred.
- The Marine Group and BAE Systems expressed concerns that it is unclear if Portland can accommodate 200 truckloads of material and waste per day and how their estimated 1 barge/day at Swan Island SDU can be accomplished in a narrow lagoon used as part of an active industrial harbor.
- The Portland Audubon Society requested robust implementation of Implement air, water and fish tissue monitoring during construction, while Portland General Electric suggested that due to the lack of in-depth analysis, "It is conceivable that the cleanup activities have the potential to produce more adverse risks and injuries than the risks posed by the current condition of the river."

Commenters pointed to many short-term impacts that they did not feel were adequately addressed in the ROD including:

- Occupational and implementation related injuries, disease, and deaths caused by the cleanup activities
- Potential for accidents during construction
- Community impacts from construction activities and increased traffic (water, road and rail)
- Business disruption
- Negative net economic impact
- Noise, air, and light impacts
- Recreation disruption

- Greenhouse gas and air pollution discharges
- Release of contaminants during dredging
- Fish advisories during construction

To address noise, air, light and other quality of life issues, Olympic Tug and Barge recommended using the *Environmental, Economic, and Social Analysis Reports* prepared by AECOM, NERA, and SEA Environmental Decisions, Ltd. on behalf of the Portland Harbor Superfund Site Sustainability Project for submittal to U.S. EPA in September 2016 (Portland Harbor Sustainability Project 2016).

Some commenters were more concerned with short-term risks, and requested consideration of alternative B or another option that minimized short-term impacts. Others felt that long-term effectiveness should have more influence in alternative selection than short-term effectiveness, and requested EPA select a more aggressive option than alternative I because it appears to prioritize short-term effectiveness over long-term effectiveness. Union Pacific asked EPA to explain "… how the preferred alternative's combination of active remediation and monitored natural recovery achieves cleanup goals in a substantially shorter time than less aggressive alternatives using a different combination …." LWG questioned why Alternative B received a lower score than alternatives with longer and more extensive construction, and questioned why none of the alternatives were classified as "best" for short-term effectiveness.

EPA Response

EPA's two threshold criteria for selection of a Superfund remedy are protection of human health and the environment and compliance with the substantive requirements of federal and state environmental laws. Short-term effectiveness is one of five balancing criteria, which EPA used to perform the detailed analysis of alternatives.

EPA short-term effectiveness analysis was conducted in accordance with NCP. 40 CFR §300.430(e)(9)(iii)(E), which states:

> *The short-term impacts of alternatives shall be assessed considering the following:*
>
> 1. *Short-term risks that might be posed to the community during implementation of an alternative;*
> 2. *Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures;*
> 3. *Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and*
> 4. *Time until protection is achieved.*

In addition to the short-term effectiveness evaluation in Section 4.2 of the feasibility study report (USEPA 2016b), potential impacts on various human uses of the Site, including recreational, commercial and subsistence fisheries, water-related recreation, aesthetics, riverside parks, and other uses were evaluated in Appendix L of the feasibility study report, in compliance with Section 404 of the Clean Water Act. EPA disagrees that the feasibility study analysis does not allow for meaningful comparison amount alternatives, including consideration of proportional differences in short-term impacts.

Additional evaluation of short-term impacts and mitigation measures will be ongoing throughout remedial design and construction planning while specific technologies and schedules are planned for each area of the Site. See also responses to Union Pacific Railroad Dispute Issue 5, RALs, Transparency, Sustainability, Dredging, Economic Impacts, MNR, and Sheet Piles comments for additional information regarding short-term impacts. Fish advisories during construction will be established as discussed in responses to ICs.

Per the NCP as stated above, EPA must consider not only short-term impacts, but mitigation measures and effectiveness of those measures as well. A summary of the evaluation of these factors is provided in Sections 4.2.2.5 and 4.3.5 of the feasibility study report. While the implementation of the remedy is likely to present various short-term construction-related impacts to the Portland Harbor community due to potential increased road, train and river traffic, noise, and other construction related activities, these impacts will be mitigated to the extent practicable. For example, EPA is recommending the use of barges as the primary means of transport coupled with use of off-site transload facilities to minimize impacts on the community. Section 4.2.2.5 of the feasibility study report outlines the mitigation measures and best management practices that will be implemented to protect the community, workers, and the environment during construction of the remedial action.

EPA is committed to working with the community to minimize short-term impacts, including any temporary disruptions to public amenities. In addition, EPA requires site-specific and activity-specific health and safety plans be implemented by the parties performing the cleanup, so that the cleanup is conducted in a safe manner. EPA has conducted extensive community outreach during the development of the remedial investigation, feasibility study, and proposed plan (USEPA 2016c) and is committed to maintaining a transparent, proactive community interaction process during each cleanup phase and on all key elements of the design and implementation. For more information regarding monitoring and mitigation of construction-related impacts, see Sections 2.2.9, 2.17.3, and 2.17.4 of this responsiveness summary.

EPA also acknowledges that enhanced fish consumption advisories will be needed during implementation to address the potential for fish to be exposed to contaminants and subsequently increase human health risk of eating those fish. For more information on fish consumption advisories, see Sections 2.3.2 and 2.28.2 of this responsiveness summary.

EPA acknowledges that Table 4.3-3 of the feasibility study report contained an error which designated Alternative B short-term effectiveness as “Moderate” instead of “Best.” However, Alternative B does not meet the threshold criteria and was therefore not a viable alternative.

EPA did not prioritize the minimization of short-term risks over the minimization of long-term risks. Per EPA guidance, short and long-term risks were not looked at as tradeoffs, but rather as part of a holistic view of alternative evaluation. While Alternative G may have the most reduced long-term risks, the feasibility study report selected Alternative I in part due to its superior ability to minimize short-term disruption and risks. The selected alternative in the ROD, Alternative F Modified reduces long-term human health risks more quickly than Alternative I and minimizes reliance on ICs and likewise minimizes short-term disruption and risks over Alternative G. See Sections 2.1.1 and 2.31.1 of this responsiveness summary for additional information on alternative evaluation and selection.

2.20.2 Consider Externalities in Designing a Remedy

Comment Summary

Two comments were received that requested a remedy that provides greater overall benefits to the community. One commenter stated that although EPA's mandate under CERCLA required a focus on reducing health risks of contaminant exposure, an interest in "broader public health benefits" should be factored into the cleanup decision, such as how the project design should address the impact of the expanded truck and barge traffic via diesel emissions and improving access to greenspaces to promote better health. They requested more clarity in interim benchmarks - how they were generated, how can they be implemented, and what flexibility might there be for strategies that hit the performance measures of improved habitat and lower cancer and overall health impact. One person believed that the alternative evaluation process should take into account potential costs to human and environmental health from the "full effects of living next to a river full of PCB's."

EPA Response

The Superfund law, CERCLA, sets out EPA's authorities for responding to releases of hazardous substances and pollutants or contaminants into the environment and established requirements that all CERCLA remedies must meet. CERCLA's implementing regulations, the NCP, provides the framework used to investigate releases, evaluate the risks posed by the releases, evaluate cleanup alternatives, and select a final remedy - among other things. Most relevant to the commenters concerns, the NCP, established nine evaluation criteria that puts the statute's mandates in a decision-making framework for assessing individual alternatives and performing a comparative analysis that focuses upon the relative performance of each alternative against those criteria. The overarching goal of the CERCLA response is to ensure protectiveness of human health and the environment. Protectiveness is one of the two threshold criteria for remedy alternative evaluation. Consideration of public health benefits and overall improvement in the community is for the most part outside the scope of a CERCLA response. EPA may implement remedies that minimize the environmental footprint of a remedy such or take into consideration land use consideration in the implementation of the remedy.

Another remedial alternative evaluation criterion is short-term effectiveness. Key factors considered during the evaluation of short-term effectiveness include protection of the community and workers and minimizing environmental impacts during remedial actions. Consistent with national and regional Green Remediation guidance, EPA's remedy can factor in mitigating activities to limit the overall environmental footprint of the response.

EPA has taken into consideration many of the short-term impacts commenter expressed to the extent that they are within the scope of the CERCLA law. EPA will limit impacts to the community from performance of the cleanup itself by using barges rather than trucks or rail to transport contaminated sediments for disposal. The response will minimize volatile emissions and odors from excavation using activities such as pollution control devices during construction activities routing trucks in a manner that avoids schools, or upgrades to road facilities to increase safety in the context of increased truck traffic in remedial design. Best management practices to reduce short-term impacts will be further considered to reduce emissions include, but are not limited to:

- Use of reusable energy sources.
- Limit idling of trucks and equipment.
- Rely on local sources of materials.

- Ensuring that trucks, barges and railcars are full prior to transport.
- Implement on-site dust and noise control to reduce air pollutant and greenhouse gas emissions.
- Require clean fuel and emissions control retrofit incentives in construction contracts.

Measures will be developed during the design process to reduce impacts of habitat as part of the cleanup and there will be a need for compensatory mitigation where loss occurs. EPA's authority under CERCLA however is limited to remedial actions designed to address releases of hazardous substances or pollutants and contaminants. While some of the nine evaluation criteria involve considerations of overall protection of human health and the environment, long- and short-term impacts, the focus of cleanups are reducing or eliminating exposure to the hazardous substances or pollutants and contaminants.

Some considerations requested by the commenters are outside the scope of EPA's authority. For example, consideration of diesel emissions from Interstate 5, health care costs, and increasing access to greenspaces. However, by reducing contaminant levels in surface water and sediment, EPA expects to increase the opportunity healthy recreational opportunities (such as boating, swimming, and fishing) in the Lower Willamette River thus contributing to the overall health of the community.

2.20.3 Explain Preference for Alternative I in Terms of Increased Fish Meals

Comment Summary

One comment was received that stated:

- "EPA's preferred Alternative I will restrict fish meals for most populations to a rate of no more than 6 fish meals every 10 years throughout the construction period. (Plan, pp. 58 - 59.) After construction, Alterative I achieves 50 fish meals every 10 years. EPA advocates this result without explaining how 5 fish meals per year addresses the nutritional requirements or recreational concerns of either tribal or recreational fishers. There is no obvious reason to prefer Alternative I (7 years of 0.6 fish meals to achieve 5 fish meals per year) to Alternative B (4 years at 0.6 to achieve 3 per year) or, for that matter, to Alternative G (19 years at 0.6 to achieve 10 per year). EPA's preference seems wholly arbitrary."

EPA Response

The number of acceptable fish meals per unit of time represents nothing more than a calculation of post-construction or residual risk, based on predicted tissue concentrations using the food web models developed and used by LWG. Consistent with the assumptions used in the BHHRA (Kennedy/Jenks 2013), post-construction fish consumption risks on a river-mile scale were evaluated using PRGs calculated based on a consumption rate of 49 grams per day. Within the Site, persistent contaminants (particularly PCBs, chlorinated pesticides such as DDT, and polychlorinated dioxin and furans) from sediments and surface water bioaccumulate in the food chain, resulting in higher concentrations of the contaminants in fish tissue than in sediments. Existing Oregon Health Authority fish consumption advisories apply to all resident fish at the Site, including carp, bass, and catfish, advising none of these fish be consumed by children under age 6, women of childbearing age, and people with thyroid or immune system problems and no more than 1 fish meal per month for everyone else. These resident fish, in contrast to migratory salmon, are the main contributors to human health risk associated with consumption of fish from the Site. Fish advisories once cleanup has achieved its goals, though less restrictive in the future, may need to remain due to broader watershed issues.

2.21 Implementability

2.21.1 Consider Geotechnical Issues in Dredging Adjacent to Improved Shorelines

Comment Summary

One commenter said that although the proposed plan states that "where SMAs are projected onto the river bank, removal followed by capping is the assigned remedial technology," EPA has failed to consider the technical and regulatory difficulties that would be associated with dredging adjacent to such banks and associated over-water structures, or the actual costs that would be associated with implementing that portion of Alternative I. Due to the river-dependent uses of river frontage properties, banks are typically over steepened beyond the angle of repose associated with the native soils and sediments, and the angle is maintained by the presence of extensive arrays of piling, rip rap or bulkhead and overwater structures throughout the Site.

EPA Response

During remedial design, geotechnical issues related to area-specific features will be evaluated. The decision tree in the ROD has been revised to clearly outline this process. Also, EPA agrees that maintaining flexibility in construction methods through the remedial design phase is an important consideration, particularly for nearshore areas near structures and area with debris.

Dredging adjacent to river banks and associated over-water structures require special considerations that warrant a more engineered design and will be given further consideration of key details during design, such as geotechnical data to be collected, which may restrict dredging/capping areas or otherwise change the area-specific design.

Cost associated with these issues are captured under bid contingency, which accounts for changes that occur after the construction contract is awarded. Examples include technological, geotechnical, and other unknowns applicable to the construction phase.

2.21.2 Be Flexible in Technology Selection and Implementation

Comment Summary

Three comments were received that expressed the concern that EPA's proposal to remove sediments adjacent to critical structures and utilities could potentially jeopardize the integrity of these structures. Comments stated that the docks and other in-river structures are vital to trade and commerce and their removal would cause severe negative consequences for some commercial operations along the Site.

Commenters believed that EPA should retain sufficient flexibility to allow for evaluation of emerging technologies, including in-situ options, for areas such as RM 11E. The ROD should provide flexibility in making technology assignments beyond the limited decision tree options identified in the proposed plan where site-specific conditions so require.

EPA Response

EPA appreciates the concern expressed by commenters elated to ensuring that critical structures and utilities are not jeopardized. EPA used several lines of evidence based on conditions described in the remedial investigation report to determine the appropriate technology to apply to various areas of the Site. Particular information developed during the remedial investigation regarding river bottom, depth, or other physical condition and river use was applied in selecting technologies to evaluate in the feasibility study. The 2016 feasibility study report (USEPA 2016b) applied information about currently

known conditions to develop remedial alternatives that can be compared to each other to inform remedy selection. Example technologies were evaluated for cost estimating purposes only. Updated information about river conditions and land or river use will be obtained during remedial design in order to determine appropriate technologies to apply. Details regarding the use of sheet piling will be determined during remedial design which is the appropriate time for those types of evaluations.

EPA agrees that maintaining flexibility in type of construction methods through the remedial design phase is an important consideration. The ROD includes a flexible decision tree along with general design requirements to guide the assignment of capping and dredging technologies, based on specific characteristics within SMAs. The decision tree will be used during remedial design to define what actions should be taken under different environmental conditions and locations based on the most recent design data. Once the data and river factors are evaluated within the context of the decision tree, a final design for construction can be completed. This design will then dictate the remedial construction. The decision tree is intended to provide clear direction on what actions should be taken under the different environmental conditions.

2.21.3 Explain Design Considerations Near and Adjacent to Navigation Channel

Comment Summary

The USACE and the City of Portland expressed concerns about the design considerations considered for the use of beach mix backfill and capping near and adjacent to the navigational channel. It was stated that, as parts of the river are erosional, measures should be required to ensure that the beach mix will stay in place. It was requested that EPA explain design considerations to account for and counter any erosional forces on beach mix backfill. If channel dredging occurs in the future, the stability of a cap could be undermined and the commenters believed that the ROD should state how EPA would implement capping in this situation to prevent future slope failure.

EPA Response

For the purpose of the feasibility study, a set of generic cap designs successfully implemented at other sediment dredging superfund sites (like *GM Massena Superfund Site, Eagle Harbor Superfund Site*) were applied based on Site-specific conditions, including the need for reactive materials to contain PTW and armoring to prevent erosion of the cap material. To facilitate consistent application of capping technologies, all caps were assumed to be 36-inch thick and comprised of various combinations of sand, beach mix, activated carbon, organoclay, and armor stone. Additional considerations are presented in *Section D4. Cap Thickness Evaluation,* Appendix D of feasibility study report (USEPA 2016b). The actual composition and thickness of sediment caps that will provide long-term permanence will be determined during remedial design.

Therefore, the specific information in the feasibility study report associated with cap material, thickness of caps and/or types of cap layers were assumptions for the purposes of evaluating alternatives according to CERCLA criteria and developing cost estimates for the remedial alternatives. These assumptions were developed based on the existing data and will be finalized during the remedial design, after design level data to refine the baseline conditions are obtained.

During the remedial design, factors such as proximity to navigational channel, erosion associated with wind, ship scour, river currents and vessel-generated waves would be considered in accordance with the decision tree as part of remedial design to provide long-term effectiveness and permanence and balanced against habitat considerations. The ROD includes a flexible decision tree along with general

capping design requirements to guide the assignment of capping technologies, based on specific characteristics within SMAs. It is understood that some levels of armoring may require on or off-site mitigation, which will be considered during design and discussed with the services. Also, no capping would occur in designated navigation channels unless below the navigation depth, with an appropriate buffer/overdredge allowance in areas which may require dredging in the future.

2.21.4 Identify and Stage Realistic Sediment Transload and Treatment Facilities

Comment Summary

Two commenters believed that EPA fails to thoroughly describe and consider parameters associated with the implementability of the remedial alternatives in identifying and staging realistic sediment transload and water and sediment treatment facilities. They stated that EPA's analysis fails to take reasonable account of the lack of suitable transload facilities (or extended construction times to ready upland sites for transloading operations), or of the shortages in available and qualified source material for capping activities (given the expected stringent import criteria including a PCB replacement value of zero).

EPA Response

As part of the feasibility study, EPA talked with the representative facilities for dredging, barging (Tidewater Transportation & Terminals), transloading, and disposal (ChemWaste, Port of Morrow-Boardman) in the area. None of these facilities indicated any significant concerns about logistics in handling large quantities of sediment. Portland Harbor is a working industrial waterway that has the necessary infrastructure to support large sediment remediation activities.

From experience with other sediment cleanups, the feasibility study assumed that that all necessary pretreatment (including dewatering dredged material, managing and treatment of wastewater generated during the dewatering process) and handling of dredge materials will occur on the barge prior to arrival at a transload facility or ultimate disposal facility. Although the feasibility study acknowledged that an on-site transload and materials handling facility could be sited, the cost estimates did not assume stockpiling of material on a particular upland facility nor at the transload facility. The water collected on barges could potentially be discharged to the lower Willamette River (with or without treatment in accordance with regulations, such as multistage solids removal) or disposal at a publicly owned treatment works facility after appropriate and required treatment. EPA acknowledges that an expanded treatment system may be required for some material, particularly PTW. Also from experience, it was assumed that the dredged material will be mixed with diatomaceous earth on the barge to absorb water along with gravity decanting, thus reducing the requirement for dewatering and water treatment during transload and transportation for disposal.

Also, the feasibility study report (USEPA 2016b) looks at modes of transport and associated transload of wastes from a macro perspective, but the primary assumption in the feasibility study was to use barges for the purposes of implementability and cost evaluation. The feasibility study also indicated that multiple modes of transport could be used and could be evaluated during remedial design phase of the project. Thus, the impact on rail and highway infrastructure within the City of Portland can be minimized. Various disposal facilities did not indicate to EPA any significant concerns about logistics of handling the required volume for transportation, transload and disposal. Even though there might be a heavy barge traffic, the transload for all dredged material may not be at the same location.

2.21.5 Consider Parameters Associated with Treating Large Volumes of Contaminated Sediment

Comment Summary

Three commenters believed that EPA fails to thoroughly describe and consider parameters associated with the implementability of the remedial alternatives in potentially treating large quantities of sediment.

EPA Response

The feasibility study report (USEPA 2016b) considered that the materials removed for ex-situ low temperature thermal desorption treatment is to be treated at an off-site disposal facility. The assumption used estimated the quantity of removed material for ex-situ treatment to be roughly 15,000 cubic yards or 12,600 tons (*Table D2.d. Treatment and Disposal Quantities* (*based on assumptions presented in Appendix D2.4 of 2016 feasibility study report*). Assumed ex-situ treatment included low temperature thermal desorption treatment. The actual quantity of material which might require such treatment will be determined during design based on federal or state regulations and/or the off-site disposal facility.

EPA talked with the representative facilities including ChemWaste, Port of Morrow (Boardman) and the barging company (Tidewater Transportation & Terminals) and they did not indicate any significant concerns regarding the logistics of material handling as well as the amount that can be accept each day at the facility for ex-situ low temperature thermal desorption treatment or any issues with treatment limitations.

2.21.6 Consider Implementability in Terms of Community Acceptance of Short-Term Impacts

Comment Summary

One comment stated that EPA fails to thoroughly describe and consider parameters associated with the implementability of the remedial alternatives in obtaining community acceptance, particularly of short-term impacts such as noise, light, and vehicle traffic.

EPA Response

Based on comments received during the public comment period, EPA has thoroughly considered implementation impacts from community acceptance. EPA appreciates the concerns of the public, local workforce and businesses as important segments of the community as well as the desire expressed in many comments to reduce the impact due to remedy implementation.

EPA will develop a monitoring program during the remedial design phase and will consider public input (Section 2.17 of this responsiveness summary). Concerns about noise, odor, light, and other potential community impacts will also be considered and addressed to the extent possible. Exceedances of monitoring thresholds will result in additional controls being put in place so that construction impacts are mitigated to the extent practicable. EPA will provide contact information for community members to raise complaints or concerns during the course of construction.

Cleanup activities, including the use of dredges and barges will generally be consistent with existing uses of the river in terms of the level of noise, lighting, and human activity that already exists. During the construction period, there would be increased barge traffic as barges transport dredged material from the active cleanup area downstream. Cleanup activities with the potential to restrict navigation in the

harbor channel will be coordinated with the USACE, U.S. Coast Guard, and other stakeholders during remedial design.

2.21.7 Ensure Free Passage of Ship Traffic during Remediation

Comment Summary

Two commenters stated that EPA fails to thoroughly describe and consider parameters associated with the implementability of the remedial alternatives in placing obstructions to the navigation channel and the requirements to move the dredge and its support vessels and structures to allow for the passage of ship traffic on an ongoing and continuous basis. The following link provides an illustration of the impact of passing vessels on dredging (http://dofnw.com/animation/).

Additionally, the RM 11E Implementability Study Report found that several hundred vessels (ocean going ships, tug boats, and barges) use or traverse the RM 11E area every year, with vessels using over-water RM 11E facilities almost every day. The ROD should acknowledge these constraints.

EPA Response

Remedial activities with the potential to obstruct navigation temporarily in the harbor channel will be coordinated with the USACE and U.S. Coast Guard, including necessary containment measures to minimize sediment dispersion in areas where NAPL extends into the navigation channel.

In the feasibility study report (USEPA 2016b), sheet piles are considered as a representative engineered rigid control measure identified and evaluated for sediment dispersion control. However, that representative approach does not preclude other types of rigid control measures for consideration during remedial design. As stated in Appendix O of the report, EPA agrees that depth can limit the use of suitable engineered options for controlling releases, and deep water depths can preclude the use of sheet piles. EPA assumes that engineered rigid containment will be utilized when NAPL was present in water depths less than 50 feet. The feasibility study report acknowledges that "Release and residual management measures such as silt curtains and sheet piles may be difficult to construct and reliably operate in portions of the river affected by navigation traffic, deeper water, and significant current, this may lead to schedule and implementation delays."

Engineered rigid control measures, which has the potential of obstructing the navigation channel, were evaluated holistically within the feasibility study report for their use in reducing or eliminating short-term releases of contaminants during construction and not on a location-specific basis. Thus, the feasibility study report does not present figures indicating design level logistical details regarding location and depth of engineered rigid control measures. Details (such as type and location) regarding engineered rigid control measures will be determined during remedial design.

Regarding the RM 11 area, The ROD acknowledges that, during remedial design and remedy implementation, various implementability factors such as dredge production rates, seasonal timing, and other factors will be considered to minimize facility closures and to avoid adverse economic impact to waterfront businesses.

2.21.8 Ensure Remediation Time Frames Are Realistic

Comment Summary

Many comments were received from LWG, other businesses and industry organizations regarding the construction durations utilized in the feasibility study. The majority of the commenters stated that the construction durations presented in the feasibility study were overly optimistic and did not take into

account the potential for delays associated with the time necessary to prepare dredging areas (such as, installation and removal of sheet pile wall and placement and removal of silt curtains), move operations from one dredge area to another, manage debris, implement construction related BMPs and place capping materials. They commented that the construction duration estimates did not account for siting and development of sediment and water staging, handling, treatment and transloading facilities. Finally, the commenters stated that the potential effects of process bottlenecks at the transloading/water treatment facilities, delays due to roundtrip transport to the disposal facility and lost time due to the requirement to move and reposition dredge vessels to avoid disrupting navigation were not considerations.

The commenters stated that failure to properly consider these factors inappropriately skewed the evaluation of dredging-based alternatives in the feasibility study. They further commented that the use of overly optimistic production rate assumptions and the related underestimation of dredging duration and costs precluded meaningful comparison of the cost effectiveness of remedial alternatives as required by the NCP and CERCLA. They also stated that these incorrect assumptions result in a preferred alternative that is not an accurate representation of the actual impact Alternative I would have on the community and operations within Portland Harbor.

A specialized dredging firm provided a detailed evaluation of the various construction durations presented in the feasibility study and proposed plan. The commenter stated that based on an evaluation of production rates achieved at environmental dredging projects in the Pacific Northwest, average open water and confined dredging production rates are 1870 and 1060 cubic yards per day respectively in comparison to the rates of 2382 and 1190 cubic yards /day used in the feasibility study. The commenter further concludes that based on a 17 week dredging season (July 1 through October 31), it would take an estimated 4.1 years of dredging with two dredges to implement dredging activities associated with EPA's preferred alternative which is approximately one-third longer than the 3.1 years of dredging estimated by EPA for two dredges operating in tandem.

One commenter cited the dredging activities implemented at the Boeing Plant 2 early action project as the basis for concluding that the dredging production rates were over estimated. The commenter noted that the dredged schedule of 20 hours per day, six days a week was met only 75 percent of the time. The primary factors that resulted in lower production rates included transload facility production rates, railcar availability, and down time for water treatment system. The same commenter also noted that EPA stated in an earlier version of the feasibility study that the daily and weekly durations of removal operations may be refined if community quality of life concerns (such as night-time noise or light pollution) are identified.

Finally, a LWG member commented that the proposed plan is unacceptably vague regarding the length of time between issuance of the ROD and commencement of construction of the remedy. EPA provides vague estimates by reference to a "Year 0" but does not articulate what must occur before or after Year 0 and how long those activities will take. For example, it is unclear whether entering into consent decrees, initial conditions sampling, remedial design (and any additional investigation), construction of a material handling facility and construction mobilization occur before or after Year Zero and how long each will take.

EPA Response

The assumptions and calculations regarding dredged production rates were included in Appendix D, Table D3-1 of the 2016 feasibility study report (USEPA 2016b). The assumptions about factors such as

bucket volume, cycle time, and percent bucket fill are considered reasonable based on USACE guidance (*Technical Guidelines for Environmental Dredging of Contaminated Sediments*, September 2008 [USACE Environmental Dredging Guidelines], Table 1, page 88)) (Palermo 2008) and the experience at other sediment remediation projects around the country and in the Pacific Northwest.

As noted in Table D3-1, daily dredge production rates were developed assuming a 55/45 percent mix of cable arm versus articulated bucket dredges, based on the approximate areal percentages of navigation channel and maintenance dredge areas in the alternatives. Based on the size of the Site and experience at other sites, dredging and excavation operations are assumed to occur 24 hours/6 days per week using three dredges. The feasibility study notes that the daily and weekly durations of removal operations may be refined if community "quality of life" concerns (such as nighttime noise or light pollution) are identified. However, due to the industrial nature of the Site and surrounding area, the feasibility study assumed that 24 hours per day dredging activities can be achieved. Section 2.17.4 of this responsiveness summary addresses quality of life monitoring concerns.

As described in Table D3-1, the planning-level productivity estimate for a cable arm dredge was developed based on operational characteristics for environmental dredging and guidance presented in the USACE Environmental Dredging Guidelines. The production rate is the product of the bucket volume (10 cubic yards), cycle time (2 minutes), and percent bucket fill (60 percent), adjusted for effective working time (62.5 percent).

The basis for specific assumptions (using USACE Environmental Dredging Guidelines) is summarized below:

- Bucket Size: USACE guidelines provide a cable arm bucket size of 3 to 10 cubic yards. As described in (USACE 2013), recent environmental dredging projects completed at Buffalo River and Indiana Harbor used 15 cubic yard buckets. As a result, a 10 cubic yard bucket size was selected.
- Cycle Time: USACE guidelines provide a cycle time of 2 to 4 minutes. As described in Schroeder and Gustavson, 2013, a typical cycle time without restrictions would be 1.5 to 2 minutes when dredging at depths greater than 35 feet. As a result, a 2-minute cycle time was selected.
- Percent Bucket Fill: USACE guidelines provides a percent bucket fill of 0.5 to 0.65. As a result, a percent bucket fill of 60 percent was selected.
- Effective Working Time Efficiency: USACE guidelines provides an effective working time of 55 to 70 percent. The selected value of 62.5 percent represents the mid-point of this range.

Based on these assumptions, the cable arm dredge productivity rate is approximately 2,700 cubic yards/day/dredge plant. The productivity estimates of the articulated bucket dredge are derived from recent site experience at Boeing Plant 2 removal at the Duwamish River Superfund Site. There, the daily production rate during the latest season of dredging was approximately 1,150 cubic yards/day using a single 4-cubic yard excavator-mounted bucket.

Regarding the estimate use of fixed arm vs. cable arm dredging, Table D3-1 states: "Daily dredge production rates were developed assuming a 55/45 percent mix of cable arm versus articulated bucket dredges, based on the approximate areal percentages of navigation channel and maintenance dredge areas in the alternatives." Assuming a 55/45 percent mix of cable arm and articulated bucket dredges, a total production rate of 6,000 cubic yards/day was estimated for daily production as follows: [(55

percent * 2,700 cubic yards/day) + (45 percent * 1,150 cubic yards/day)] * 3 dredge plants = 6,000 cubic yards/day estimates. It's acknowledged that the text in the main body of the feasibility study that is referenced by the commenters does not clearly state this basis.

A number of commenters stated that the time necessary to prepare dredging areas, move operations from one dredge area to another, manage debris, implement construction related BMPs and place capping materials, allowances for work disruption, and other impediments to dredging operations were not considered. However, consistent with the USACE Environmental Dredging Guidelines (p. 131), these factors are considered through the use of an "Effective Work Time Factor:" "Effective working time is the time during the dredging operations when actual production is taking place, such as material moving through the pipeline or being placed into a sediment barge. This is also referred to as 'operating time.'" The Effective Work Time factor accommodates "when the dredge is operational but no production is taking place, such as time spent making changes to pipelines, cleaning debris from the suction head, changing sediment barges, moving the dredge, standing by for navigation traffic, making minor operating repairs, and refueling. This is also referred to as 'allowable downtime.'" The USACE Environmental Dredging Guidelines (p. 93) states that the effective working time is "typically 55 to 70 percent for environmental dredging projects." The estimate used in the 2016 feasibility study (62.5 percent) was the midpoint of that range. In this regard, dredge "operating time" is estimated to occur 15 of 24 hours, six days per week. The effective working time factor was explicitly used to the accommodate issues identified by the commenters as well as other unforeseen circumstances. As further stated in the 2013 memorandum (USACE 2013):

> *"A work schedule of 6 days at 24 hours/day with three dredge plants on site is recommended, equating to approximately 5,600 cubic yards per day with current production assumptions. To further refine this estimate, the cycle time, fill percentage and effective work time should be reviewed based on site-specific conditions, resuspension control plan and residuals management plan. The existing estimates for these parameters are conservative and typical of shallow cuts with stringent controls on overdredging, resuspension (e.g., silt curtains), and residuals. For example, thicker cuts could significantly increase the production rate. A target production rate of 6000 cubic yards/day, 6 days per week should be achievable even with the assumed efficiency impacts of resuspension control and residuals control and management if water quality, processing and disposal requirement can be met. A target production rate of 6000 cubic yards/day, 6 days per week should be achievable even with the assumed efficiency impacts of resuspension control and residuals control and management if water quality, processing and disposal requirement can be met."*

The feasibility study assumes that dredging and excavation operations to occur 24 hours/6 days per week using three dredges. Also, the duration of the dredging season is assumed to be 122 days based on the typical in-river fish work window (the work window is adjusted annually based on the actual runs by NMFS in consultation with Oregon Department of Fish and Wildlife) established for the Willamette River of July 1 through October 31. The daily and weekly durations of removal operations may be refined if community "quality of life" concerns (such as nighttime noise or light pollution) are identified. However, for this feasibility study report, it is assumed that 24 hours per day dredging activities can be achieved given the industrial nature of the majority of the surrounding areas. Also, it is assumed that other related construction activities will be performed in-parallel to the in-river work.

Overall, this and other comments on dredge production imply that overly high production rates falsely equate to shorter construction durations. Even if these feasibility study-level production rate estimates are high, other assumptions lessen the production rates. For example, the in-river construction duration is based on the assumption that "Cap and ENR construction is assumed to occur in sequence (not in parallel) with dredging for estimating total construction" (Table D3-1). This means that all dredging would occur, then all capping would occur. This assumption is reasonable for a feasibility study level evaluation of construction duration. However, it is likely or possible that remedial construction activities would be sequenced by area, generally moving from upstream to downstream, capping/dredging contaminated sediment, before moving on to the next area whenever possible which would reduce overall construction timeframe from the assumptions used for the feasibility study. As a final point, because all alternatives have dredging to some degree, changes to the dredge productivity rates would have similar effects across all alternatives, and not significantly influence remedy selection.

Once commenter provided alternate production estimates based on assumptions regarding bucket size, fill factor, bucket cycle time and effective working time also based on the USACE 2008 Environmental Dredging Guidelines and their experience with similar projects implemented in the Pacific Northwest. From our review of their analysis, that analysis compares favorably to assumptions used in the feasibility study. That review concluded that production rate could be 3740 cubic yards/day for two dredges operating in tandem, whereas, the EPA feasibility study estimated of 6,000 cubic yard/day using three dredge plants. In addition, the estimate of 4.1 years of dredging with two dredge plants is similar to the EPA estimate of 3.1 years of dredging for three dredges operating in tandem.

While various dredging production rates can be developed based on alternate assumptions regarding bucket volume, cycle time, percent bucket fill and effective working time, the assumptions used and production estimates resulting from them presented in the feasibility study are consistent with guidance and the experience at other sediment remediation projects around the country and in the Pacific Northwest and represent an appropriate level of accuracy for a feasibility study level evaluation. In addition, any uncertainty in construction duration does not skew the evaluation of alternatives since the dredge production estimates were developed in a consistent manner across all alternatives. Similarly, although the feasibility study and proposed plan (USEPA 2016c) did not consider the length of time between the ROD and the commencement of remedial activities at the Portland Harbor Site, this length of time is expected to be consistent between alternatives and thus has no bearing on the selection of EPA's preferred alternative because it does serve to distinguish one alternative from another.

Regarding the length of time that construction would take in comparison to MNR, it should be noted that the estimated construction duration for Alternative F Modified is 13 years while MNR is expected to take much longer. In addition, without the targeted removal and capping associated Alternative F Modified, MNR is expected to be much less effective.

2.21.9 Ensure Cleanup Does Not Impact Site Features

Comment Summary

The City of Portland, Port of Portland, Sediment Management Work Group, and the RM 11 – PacifiCorp all expressed concern that EPA needs to consider outfalls, water mains, sanitary lines and other utilities, bridges, docks and other infrastructure, maritime and bridge traffic, terminal operations, existing remedial caps and shoreline stabilization, steep slopes, buried/under water power/utility cables, and areas to manage dredged materials in the assignment and implementation of remedial technologies. The City called to attention a water main and sanitary force main that cross the river. They requested EPA consider current and future utilities, and use precautionary measures to assure protection and long

term access of public utilities. The City also commented that the cost of relocation or alteration of utilities as well as future associated maintenance costs should be factored into remedy costs.

EPA Response

EPA considered overall site information to determine general feasibility of capping, dredging and application of other remedial technologies. Details of public utilities and other site features will be considered during remedial design. EPA agrees that it will be necessary to plan and take precautions to prevent damage, destabilization and other adverse impacts during construction. If impacts are unavoidable, precautions will be taken to minimize impacts as much as practicable and damage will be repaired. During remedial design, site-specific surveys will be conducted to identify public utilities and infrastructure in order to account for these features in the remedial design, which may mean working around them or in some cases relocating such features. Parties planning and/or performing the cleanup will need to coordinate with landowners on details of infrastructure protection, or alternately, details of infrastructure relocation where necessary. Any proposed changes or disturbance to utilities or access of utilities will be coordinated with the City of Portland and others.

Additionally, other site-specific details will be evaluated and considered during remedial design. Specific schedules for maritime and bridge traffic and terminal operations, materials management and other higher coordination considerations will also be factored into planning during the remedial design and the construction planning process. For additional information on dredged material handling, see Appendix F of the feasibility study report (USEPA 2016b). Debris is discussed in Sections 3.4.6.3 and 3.4.8.6 of the feasibility study report. Additional responses to concerns related to river banks and dredging can be found in the dredging and river banks response to comments.

2.22 Cost

2.22.1 Perform a Cost Effectiveness Analysis

Comment Summary

Eight commenters stated that EPA failed to perform a clear cost-effectiveness analysis. It was stated that a quantitative assessment of cost-effectiveness is needed and that CERCLA requires that EPA determine that the selected remedy is cost-effective. The commenters stated that EPA must compare the cost to the effectiveness of each alternative individually, fairly and carefully weighing the costs against the benefits of the alternatives both individually and relative to each other. This evaluation should also demonstrate how the alternatives' dollar costs are proportional to their effectiveness in reducing risk.

The commenters state that EPA's proposed plan and feasibility study report omit quantitative and detailed short-term and long-term effectiveness evaluations and repeatedly underestimate the costs and durations of the alternatives. It was stated that EPA's limited cost-effective analysis in the proposed plan is insufficient to meet the standards set forth in statutes, regulations and guidance and risks a determination that its ultimate remedy selection is arbitrary and capricious. Commenters further state that due to the perceived uncertainty in the cost analysis, PRPs will be discouraged from committing to the cleanup and entering into liability settlements.

EPA Response

A cost-effectiveness determination is required as part of the two-step remedy selection process indicated at 40 CFR §300.430(f). Specifically, 40 CFR §300.430(f)(ii)(D)) describes how cost-effectiveness is determined as:

> *Cost-effectiveness is determined by evaluating the following three of the five balancing criteria to determine overall effectiveness: long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, and short-term effectiveness. Overall effectiveness is then compared to cost to ensure that the remedy is cost-effective. A remedy shall be cost-effective if its costs are proportional to its overall effectiveness.*

Page 67 of the proposed plan (USEPA 2016c) described EPA's analysis of the relevant criteria in compliance with the NCP. Likewise, the ROD at Section 15 provides EPA's analysis and determination of cost-effectiveness as provided by the NCP. Table 29 in the ROD addresses the elements of cost-effectiveness.

Neither the statute nor the NCP requires the type of rigorous tools, such as a "multi-criteria decision analysis" for determining cost-effectiveness as suggested by multiple commenters. Per the NCP [40 Code of Federal Regulations 300.430(e)(9)], the feasibility study report (USEPA 2016b) included a qualitative and comparative analysis of the individual balancing criteria of long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, and cost. The feasibility study comparative analysis has been updated to include Alternative F Modified (See ROD Table 22). And, as discussed above, the ROD includes the agency's determination of how the selected remedy (Alternative F Modified) is cost-effective as the NCP provides, see ROD Section 15.

2.22.2 Provide Costs by SDU

Comment Summary

Comments from Knife River, ESCO and Northwest Pipe request cost estimates on a SDU/SMA basis for allocation/negotiation purposes. Northwest Pipe also asked for a break-down of costs for various technologies. Comments from Shell Oil, Shore Terminal and SLR International question/challenge EPA's delineation of SDUs (or in some cases, SMAs).

EPA Response

The purpose of the feasibility study cost estimates, as stated in EPA guidance, is not to create allocation estimates, although they can be used as a starting point for that purpose. The selected remedy is a site-wide remedy decision and costs estimates were not broken-down down by SMA/SDU and by remedial technology. Specific questions noted in the Shell Oil comment letter regarding Table 4.1-1 of the feasibility study report (USEPA 2016b), which summarizes the SDUs, including the focused COCs identified for each of the SDUs, will be evaluated, along with the complete list of COCs during remedial design to ensure cleanup levels are met. During remedial design, additional data and/or re-evaluation of existing data will be considered, such as the sediment data at RM 5W referred to in the comment letter from Shore Terminals. Similarly, remedial action boundaries/SDUs will be re-evaluated during remedial design.

2.22.3 Provide Detail and Backup For Estimated Costs of Each Alternative

Comment Summary

Six comments stated that EPA's estimated costs for each alternative lack detail, accuracy, and backup.

EPA Response

EPA documented the methodology and assumptions used in developing feasibility study cost estimates in Attachment A of Appendix G of the 2016 feasibility study report (USEPA 2016). Cost estimates were developed consistent with "*A Guide to Developing and Documenting Cost Estimates during the Feasibility*

Study" (USEPA 2000) and include the level of detail and backup suggested by the guidance to meet the accuracy requirements for feasibility study cost estimates (-30 percent to +50 percent of actual cost). EPA recognizes that the intended purpose and use of cost estimates during a feasibility study for remedial alternatives may be misunderstood by those not familiar with the Superfund process, leading to the incorrect perception that feasibility study report cost estimates are "inaccurate" or not the "true" costs. EPA cost estimating guidance (USEPA 2000) states that the purpose for feasibility study cost estimates is to compare remedial alternatives during the remedy selection process, not for establishing construction project budgets nor for negotiating Superfund settlements with potentially responsible parties to pay for cleanups.

The expected accuracy stated in this guidance for feasibility study cost estimates is +50 percent to -30 percent of actual cost, which means that a remedial alternative's cost at the time of construction could be as much as 50 percent higher or 30 percent lower than as presented in the feasibility study report. These estimates are not intended to be highly accurate because the level of detail for the scope of the alternatives in a feasibility study is much lower than later during design and construction of a remedy when more data are available and there is a better understanding of the construction timelines and funding. This is particularly true of projects such as the Portland Harbor cleanup where a large number of individual parties potentially contributed to the contamination and the scope of the cleanup is large (over many river miles), so the sequencing of construction work is complex. The cost estimates are developed to reflect the understanding of the alternatives as described in the feasibility study given the understandable uncertainties that exist and will continue to exist even after a decision on a remedy approach is made, prior to design and construction.

The cost estimate backup as presented in Appendix G also includes Cost Source Database; EPA Derived Labor Costs; Project-Specific Vendor Quotes; Previously Developed Costs by Anchor QEA; EPA Derived MII Costs; and Costs from Other Projects/Sources.

2.22.4 Improve Accuracy of Production Rates, Durations, and Schedule

Comment Summary

Ten commenters stated that EPA needed to improve the accuracy of production rates, project durations, and schedules. Commenters state that dredging and capping production rates used by EPA were too high, resulting in unrealistic unit costs and construction durations. Commenters state that due to the high level of commercial activity at the Site, additional time should be added to the schedule to allow for commercial ship passage. They further state that EPA's underestimated durations result in inaccurately low estimates for other cost elements, such as the transload facility and treatment.

EPA Response

During the feasibility study, a cursory evaluation of construction duration was performed for the major construction components (capping and dredging) as indicated in Appendix D.3 of the feasibility study report (USEPA 2016b). A detailed construction schedule is generally not produced because the level of scope definition is too low to make those design-level determinations. It should be noted that schedules indicate a minimum duration and that longer durations only affect present value cost as estimated. The productivity rates presented in a technical memorandum (*Review and Recommendations on Dredge Duration and Production Rates from the Portland Harbor Draft Feasibility Study)* (USACE 2013) was used to calculate construction durations.

The USACE technical memorandum recommended that:

> "*A work schedule of 6 days at 24 hours/day with three dredge plants on site is recommended, equating to approximately 5,600 cubic yards per day with current production assumptions. To further refine this estimate, the cycle time, fill percentage and effective work time should be reviewed based on site-specific conditions, resuspension control plan and residuals management plan. The existing estimates for these parameters are conservative and typical of shallow cuts with stringent controls on overdredging, resuspension (e.g., silt curtains), and residuals. For example, thicker cuts could significantly increase the production rate. A target production rate of 6000 cubic yards/day, 6 days per week should be achievable even with the assumed efficiency impacts of resuspension control and residuals control and management if water quality, processing and disposal requirement can be met. A target production rate of 6000 cubic yards/day, 6 days per week should be achievable even with the assumed efficiency impacts of resuspension control and residuals control and management if water quality, processing and disposal requirement can be met.*"

The assumptions and calculations transmitted in the memo were included in Appendix D, Table D3-1 of the 2016 feasibility study report to estimate construction durations for each alternative. Contrary to assertions made in the comment, stepping time, allowances for work disruption, and other impediments to dredging operations are accommodated in productivity rate estimates in the USACE technical memorandum. USACE's *Technical Guidelines for Environmental Dredging of Contaminated Sediments* (Palermo 2008) recommends the use of an Effective Working Time factor (p. 131): "Effective working time is the time during the dredging operations when actual production is taking place, such as material moving through the pipeline or being placed into a sediment barge. This is also referred to as "operating time"." The Effective Work Time factor accommodates "when the dredge is operational but no production is taking place, such as time spent making changes to pipelines, cleaning debris from the suction head, changing sediment barges, moving the dredge, standing by for navigation traffic, making minor operating repairs, and refueling. This is also referred to as "allowable downtime." USACE 2008 (p. 93) states that the Effective Working Time is "typically 55 to 70 percent for environmental dredging projects." The estimate used in the 2016 feasibility study report (62.5 percent) was the midpoint of that range. In this regard, dredge "operating time" is estimated to occur 15 of 24 hours, six days per week. The Effective Working Time factor was explicitly used to the accommodate issues identified by the commenters as well as other unforeseen circumstances. As stated in the 2013 memo from (USACE 2013), "*A target production rate of 6000 cubic yards/day, 6 days per week should be achievable even with the assumed efficiency impacts of resuspension control and residuals control and management if water quality, processing and disposal requirement can be met.*"

Based on recommendations (Palermo 2008), the feasibility study assumes that dredging and excavation operations occur 24 hours/6 days per week using three dredges. The daily and weekly durations of removal operations may be refined if community "quality of life" concerns (such as nighttime noise or light pollution) are identified. However, for this feasibility study, it is assumed that 24 hours per day dredging activities can be achieved given the industrial nature of the majority of the surrounding areas.

The project/construction durations are not entirely dependent upon dredging production rates. They are dependent on other assumptions that increases the project/construction durations, for example; the in-river construction duration is based on the assumption that "Cap and ENR construction is assumed to occur in sequence (not in parallel) with dredging for estimating total project/construction duration" (Table D3-1). This means that all dredging would occur, then all capping would occur. This assumption is fine for its purpose (estimating a project/construction duration for a feasibility study -level evaluation). As a final point, because all alternatives have dredging to some degree and used the same

types of technology assignments (capping, dredging and disposal, in-situ treatment, ENR, etc.), changes to the dredge productivity rates would have similar effects across all alternatives, and not significantly influence remedy selection.

It should be noted, that construction durations for each alternative were estimated exclusively from the information provided in Appendix D; the information in Appendix G was not used in any way to calculate the construction durations that were ultimately used and presented in the 2016 feasibility study report for both cost and non-cost purposes in evaluation of balancing criteria. The information regarding productivities and dredge/capping/disposal crews in Appendix G was used solely to verify that unit costs provided for the various scope activities in the cost estimates had reasonable cost accuracy for a feasibility study level of evaluation.

The feasibility study does not provide construction schedules for alternatives, which is more appropriate during remedial design. However, cursory evaluations of project durations within Appendix D3 were included for purposes of implementability and cost evaluations in the feasibility study The feasibility study assumes that the development of transload facility will be included in the initial year of preparatory activities. The assumption of preparatory activities occurring in the initial year is stated in Footnote K, Table D3-1 (Construction Duration Assumptions) of Appendix D of the feasibility study report. The initial year of preparatory activities would include pre-design investigations and start-up activities prior to beginning construction (in-river work) and would include development of transload facility, mobilization, setting up of staging area, etc. Also, the feasibility study assumes that all necessary pretreatment (including dewatering and water treatment) and handling of dredge materials will occur on the barge prior to arrival at a transload facility. There is no assumed stockpiling of material on-site nor at the transload facility. Expansion of the transload facility or additional transload facilities (if needed) was assumed to be developed concurrently during construction (in-river work) for feasibility study purposes.

In conclusion, the information in Appendix G is solely for cost estimating purposes and has no direct relationship to the estimated construction durations, which were estimated in Appendix D3 and used for cost and non-cost evaluations in the feasibility study report. The primary sources of information for construction duration estimates in Appendix D3 were the quantities in Appendix D2, the assumptions and footnotes from Table D3-1, and the productivities and equipment assumptions from the technical memorandum (Palermo 2008).

2.22.5 Modify Contingency Percentages

Comment Summary

Six comments were received regarding modification of contingency percentages. They state that EPA used a low contingency percentage and that this is unwarranted due to the conceptual nature of the technology assignment modeling and the high level of uncertainty in applying these conceptual technologies.

EPA Response

As described in Section 5.4 of "*A Guide to Developing and Documenting Cost Estimates during the FS*" (USEPA 2000), engineering judgment may be used to adjust rule-of-thumb percentages presented in Exhibit 5-6 for scope contingency with a lower contingency indicating that project scope will undergo minimal change during design. Due to the detailed level of conceptual design performed as part of the technology assignment modeling in this feasibility study, the contingency percentages were modified to the low end of the recommended range presented in the guidance, to better reflect the detailed evaluation and concepts developed for these items.

Per guidance, contributing factors to scope contingency include the following:

- Limited experience with certain technologies
- Inaccuracies in defining quantities or characteristics
- Potential requirements due to regulatory or policy changes

Scope contingency would be expected to be higher for newer or emerging remedial technologies than for more well-documented systems. Each alternative was developed using similar technologies and major work activities. Conventional and proven technologies were used in the development of the alternatives.

The primary differences between the alternatives is the size of the footprint of removal and containment based on the area of the SMAs defined for each alternative. Therefore, the cost differences between alternatives is reflective of the differing quantities calculated in the technology assignment modeling. The development of the RALs for each alternative established a boundary for the horizontal limits of dredging/capping based on available boring data. There is a vertical limit for dredge volumes in the shallow and intermediate areas based on the technology assignments, and this will limit the risk for potential growth of volume estimates in those areas.

EPA ultimately selected a scope contingency (10 percent) within the parameters suggested by the guidance, after taking this information into account. For instance, Exhibit 5-6 of EPA guidance (USEPA 2000) indicates a recommended scope contingency range of 5 to 10 percent for surface grading/diking, 5 to 15 percent for bulk liquid processing, 5 to 15 percent for on-site and off-site disposal, and 10 to 20 percent for sludge stabilization. All of these are activities that are part of the scope of the Portland Harbor alternatives and are within the range of the scope contingency selected by EPA. While vertical barriers (10 to 30 percent) and soil excavation (15 to 55 percent) are at or higher than the selected value, the refined development of quantities and scope in this feasibility study minimize the likelihood that significant unknowns and uncertainties remain that would result in large underestimation of costs requiring scope contingency.

Bid contingency accounts for changes that occur after the construction contract is awarded. Examples include:

- Technological, geotechnical, and other unknowns applicable to the construction phase
- Changes due to adverse weather
- Material or supply shortages

Conventional and proven technologies were used in the development of the alternatives with only few exceptions because of limitations in alternative development. Technical and geotechnical unknowns associated with constructing technologies such as sheet pile should be addressed during pre-design investigation. The site-specific unit costs developed for Portland Harbor and presented in Appendix G were generally in the range of costs at other contaminated sites in the Pacific Northwest. Inputs and assumptions used in the development of the construction duration calculations included an in-river work window which is appropriate for the region.

A vast majority of the materials and supplies identified as necessary for remedial action are conventional and readily available (sand, rock, diatomaceous earth, quicklime). EPA assumes commercial source of capping materials, and confirmed that commercial suppliers could supply the required volumes, which ultimately reduces concerns about cost growth due to material shortages. Similarly, the representative disposal facilities were contacted to verify that they did not have capacity or waste type limitations leading to issues during construction.

EPA ultimately selected a bid contingency (10 percent) within the parameters suggested by the guidance, after taking this information into account. Pages 5-11 of the guidance (EPA 2000) indicates a recommended scope contingency range of 10 to 20 percent.

Unlike alternatives for some Superfund projects, the primary differences between the alternatives for the Portland harbor Superfund Site is the size of the footprint of removal and containment based on the area of the SMAs defined for each alternative. Therefore, the cost differences between alternatives is reflective of the differing quantities calculated in the technology assignment modeling. Because the differences in capital and periodic costs are primarily based on quantity differences, the use of lower percentages for contingency do not impact the comparative aspects of the costs estimates between alternatives.

2.22.6 Revisit Costs for Water Quality Control Structures

Comment Summary

Two comments were received on water quality control structures. Commenters state that although EPA is requiring the installation of sheet piles around PTW dredge areas in deep water, the cost estimate was based on less reinforced structures in shallow water.

EPA Response

Sheet piles are a representative engineered rigid control measure identified and evaluated for sediment dispersion control in the 2016 feasibility study report (USEPA 2016b). However, that representative approach does not preclude other types of rigid control measures for consideration during remedial design. As stated in Appendix O, EPA agrees that depth can limit the use of suitable engineered options for controlling releases, and deep water depths can preclude the use of sheet piles. EPA assumes that engineered rigid containment will be utilized when NAPL is present in water depths less than 50 feet.

Engineered rigid control measures were evaluated holistically in the 2016 feasibility study report for their use in reducing or eliminating short-term releases of contaminants during construction and not on a location-specific basis. Thus, the 2016 feasibility study report does not present any design level logistical details regarding location and depth of engineered rigid control measures. Location-specific evaluations for feasibility of sheet pile versus other types of engineered rigid control measures, including placement within the navigation channel, were beyond the scope of evaluation of the 2016

feasibility study report. Details regarding sediment dispersion control and location-specific engineered rigid control measures will be determined during remedial design which is the appropriate time for those types of evaluations.

Alternative-specific costs for purchasing, installing and removing sheet pile walls are presented in Appendix G. The unit costs were developed by Anchor QEA in the draft 2012 feasibility study on a horizontal linear foot basis. Quantities for sheet pile lengths used in the detailed alternative cost estimates and presented in the 2016 feasibility study report Appendix D Table D2.j (in horizontal linear feet) were holistically estimated for each alternative by encircling all PTW dredge and/or capped areas with silt curtains assumed for the remainder of dredged and/or capped areas.

Figure 3.4-33 of the 2016 feasibility study report presents areas of NAPL presence and Site bathymetry identifying water levels at the 50 feet below mean low water level. EPA acknowledges that the legend of Figure 3.4-33 should indicate that the darker shaded areas identify water depths greater than 50 feet MLLW, and the lighter shaded areas identify water depths less than 50 feet mean low water level.

Remedial activities with the potential to restrict navigation in the harbor channel will be coordinated with the USACE during remedial design, including efforts to minimize sediment dispersion in areas where NAPL extends into the navigation channel. The Rivers and Harbors Act prohibits obstructions to navigation, but CERCLA requires remedies to be protective of human health and the environment, and other federal statutes require measures to reduce impacts to Endangered Species Act species or the aquatic environment as well. It was assumed in the 2016 feasibility study report that the review for compliance with the substantive requirements of the relevant ARARs will occur during remedial design and throughout the construction of the cleanup as appropriate. However, permits and related administrative approvals, as implied by LWG, are not required for on-site CERCLA remedial actions and would not necessarily prevent implementation of these measures.

2.22.7 Provide Details on Dredging Equipment, Sediment Handling and Disposal, and Implementability

Comment Summary

Comments were received from four commenters in reference to needing additional details on dredging equipment, sediment handling and disposal, and implementability. Commenters cite specific concerns about the capacity of offloading facilities to handle the estimated quantities of material and the ability to transport the material from the offloading facilities to the respective landfills in a safe and cost-effective manner.

EPA Response

In the 2016 feasibility study report (USEPA 2016b), the estimated use of fixed arm vs. cable arm dredging is presented in Table D3-1. It states that "Daily dredge production rates were developed assuming a 55/45 percent mix of cable arm versus articulated bucket dredges, based on the approximate areal percentages of navigation channel and maintenance dredge areas in the alternatives." Also, based on this assumption of mix of dredge types, 6,000 cubic yards/day was estimated for daily production ([(55 percent * 2,700 cubic yards/day) + (45 percent * 1,150 cubic yards/day)] * 3 dredge plants = 6,000 cubic yards/day).

The 2016 feasibility study report looks at modes of transport and associated transload of wastes from a macro perspective, but the primary assumption in the report was to use barges for the purposes of

implementability and cost evaluation. The report also indicated that multiple modes of transport could be used and could be evaluated during remedial design phase of the project.

EPA talked with the representative facilities including ChemWaste, Port of Morrow (Boardman site) and the barging company (Tidewater Transportation & Terminals) and they did not indicate any significant concerns about logistics of transload of NRC/NAPL PTW waste volumes for transport and disposal at ChemWaste. It should be noted that Tidewater Transportation & Terminals was the barging company used for the Gasco Early Action. Also, through discussions with the representative facilities, the cycle time in terms of barging and trucking reflects their cycle time input for a round trip. Based on these discussions and inputs, the following cycle time for barging was assumed in the feasibility study cost estimates: 1 day of barge time to Port of Morrow (Boardman site) and 18 hours of barge time for return.

The 2016 feasibility study report cost estimate does not assume that the barged material would be stockpiled at the Port of Morrow (Boardman site) transload facility. Instead the 2016 feasibility study report cost estimate assumes direct loading in two steps; using a crane to offload from barge and a front-end loader to load the trucks, as a representative process. In addition, an off-site transload facility development cost was included to account for additional flexibility in transload. In terms of flexibility, as indicated in Appendix F of the 2016 feasibility study report, multiple modes of transport besides barging (rail or truck) could be used to transport waste to ChemWaste from transload locations as determined during remedial design. It should be noted that ChemWaste had indicated for budgetary purposes for the feasibility study that the cost of transport would not differ significantly between the various modes of transport once transload was taken into account.

The ChemWaste landfill is assumed to only be used for disposal of NRC/ NAPL PTW. As compared to the Gasco Early Action (~15,000 cubic yards), the Site remedial action will generate a large volume of waste material for disposal at ChemWaste (~359,000 cubic yards); however, this volume is assumed to be generated over a longer construction duration than the Gasco Early Action. Based on these assumptions, it is estimated that approximately 2,400 cubic yards per week (which is approximately 1 to 2 barges per week) would be handled at the transload facility for disposal at ChemWaste. As mentioned above, the barging company, the transload facility, and disposal facility did not indicate any significant concerns about logistics of handling the required volume for transportation, transload and disposal.

The assumption in the 2016 feasibility study report for contaminated sediment disposed of at a Subtitle D facility is that it is barged to Bingen and hauled by truck to Roosevelt Landfill. EPA did have a discussion with Roosevelt Landfill facility about their ability to transload material from barge and they indicated the ability to accommodate the quantity that the project may develop, specifically including their ability to handle 6,200 cubic yards/day of dredged material. They also indicated that there are sufficient options available since Roosevelt Landfill facility has agreements with a number of transload facility locations along the Columbia River. As has been demonstrated on the Gasco and Terminal 4 early actions, transload facilities can be efficiently built and optimized to suit the needs of the Portland Harbor cleanup in a vicinity to landfills that often reduces greenhouse gas emissions by extending barge or rail haul mileage, and minimizes truck haul mileage.

2.22.8 Provide Dredge Volume and Cap Overplacement Costs

Comment Summary

One commenter had concerns with the dredge volume and cap overplacement costs. The commenter believes it is prudent to assume some additional amount of contamination beneath unbounded cores, and states that EPA did not include an overplacement allowance.

EPA Response

Comments were received from six commenters stating that EPA's estimated costs for each alternative lack EPA developed dredge volumes using "neat" line volumes based on interpolated area and depth data. To take into account side slope stability (dredge prism), neat volumes were multiplied by a factor of 1.5 to estimate the Low Volume with Overdredge, and by a factor of 2.0 to estimate the High Volume with Overdredge. Total volumes for each alternative were calculated as the average of the estimated low and high overdredge volumes. This is consistent with information presented in the USACE's Technical Guidelines for Environmental Dredging of Contaminated Sediments (Palermo 2008) – Section 3.4.3:

> *"For feasibility study level considerations, an adjustment factor of 50 percent (i.e., an estimated dredge prism volume equal to 1.5 times the neat line prism volume) is appropriate for typical site conditions."*

Guidance states that the ratio of dredge prism (including allowable overdraft/overdredge) to the neat line prism can be as high as 3 based on work at the U.S. Navy Homeporting project in Everett, Washington.

Thus, the estimated dredge volume using the dredge prism to neat line ratio of 1.5 – 2.0 is reasonable for Portland Harbor and consistent with the guidance for a feasibility study level evaluation where the primary purpose is for comparing remedial alternatives during the remedy selection process.

For the purpose of the feasibility study, a set of generic cap designs was developed to be applied based on site-specific conditions, including the need for reactive materials to contain PTW and armoring to prevent erosion of the cap material. To facilitate consistent application of capping technologies, all caps were assumed to be 36-inch thick and comprised of various combinations of sand, beach mix, activated carbon, organoclay, and armor stone. The precise composition and thickness of sediment caps will be determined during remedial design.

2.22.9 Explain Mobilization and Demobilization Costs

Comment Summary

One comment was received from LWG regarding mobilization. The commenter states that EPA used a very low percentage of direct capital costs to estimate mobilization/demobilization costs instead of estimating likely costs based on project duration and scope.

EPA Response

LWG is correct that construction data were not specifically used for determination of the mobilization/demobilization factor. However, EPA's "*A Guide to Developing and Documenting Cost Estimates during the Feasibility Study*" (USEPA 2000), actual construction data are not required to be solely used. As indicated on page 5-6 of that guidance, "experience with similar projects, ***including both estimates and actual costs*** (bold emphasis added) can also be used as a source of cost data."

In addition, the determination of the percentage of the capital and periodic costs for mobilization and demobilization was based not just on review of Lower Duwamish River feasibility study, but also the Passaic River feasibility study, projects of similar scope and the equipment proposed for Portland Harbor. The types of dredge and cap placement equipment proposed in the Portland Harbor 2016 feasibility study report (USEPA 2016b) (the primary pieces of equipment requiring mobilization/demobilization from beyond metro Portland) are fairly conventional in that they are barge mounted excavation and placement equipment and not unique types of dredge equipment such as suction dredges. In addition, the number of dredge plants and capping plants and attending scow barges and tugboats are relatively small given the duration of the project. EPA has thus assumed mobilization and demobilization are representative of expected regional mobilization and demobilization costs. Procurement of any specialized equipment (such as double hull spill preventative barges) would not be cost-prohibitive with proper planning before implementing the selected remedy.

The use of a percentage of capital costs for mobilization and demobilization of equipment is reasonable for the feasibility study level of scope detail and assumptions. Real construction data will be evaluated and presented during remedial design as necessary.

It should be noted that unlike alternatives for some Superfund projects, the primary differences between the alternatives for the Portland harbor Superfund Site is the size of the footprint of removal and containment based on the area of the SMAs defined for each alternative. Therefore, the cost differences between alternatives is reflective of the differing quantities calculated in the technology assignment modeling. Because the differences in capital and periodic costs are primarily based on quantity differences, the use of lower percentages for mobilization/demobilization costs does not impact the comparative aspects of the costs estimates between alternatives. Also, it should be noted that the feasibility study cost estimates are not to be used for construction budgets, allocation, or Superfund settlements.

2.22.10 Explain Indirect Costs

Comment Summary

Comments were received from four commenters regarding indirect costs. Commenters state that EPA used very low end percentages for remedial design, project management, and construction management estimates.

EPA Response

EPA's "*A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*" does not use the term "indirect costs" for the reasons stated on page 2-5 of that guidance; thus, the response uses the more appropriate term "professional/technical services costs". As described in Section 5.5 of that guidance, engineering judgment may be used to adjust rule-of-thumb percentages presented in Exhibit 5-8 for the professional/technical services costs of project management, remedial design, and construction management as well as the recommended range presented for technical support. As described in Attachment A of Appendix G of the feasibility study report (USEPA 2016b), the percentages of professional and technical services costs will be higher for projects of smaller scope and lower for projects of larger scope. Due to the high overall costs for major work activities, the professional/technical percentages were modified to lower than the recommended range presented in the guidance, to better reflect realistic costs for professional/technical services costs for these items.

The scope of the cleanup activities within the Site (thousands of acres) is much larger than the scope of the Head of the Hylebos project (tens of acres), and therefore it is expected that the percentage for remedial design costs and categories including project management and mobilization/demobilization used as a function of capital costs will be higher for the Head of Hylebos project and lower for the Site.

The remedial design costs presented in the 2016 feasibility study report for each alternative were estimated to be comparable to remedial design costs estimated for alternatives evaluated in the Lower Duwamish feasibility study report, when reviewed on an annualized basis. The specific scope and costs for the "initial conditions assessment, subsequent pre-remedial design investigations, or additional river bank sampling and remediation" will be identified during remedial design based on factors such as funding, phasing, and scheduling of work. Unknowns or unforeseen conditions for these activities and related costs not entirely captured in the remedial design percentage can be considered to be captured in the scope contingency applied to each alternative.

2.22.11 Include Department of State Lands Fees

Comment Summary

Three commenters requested that Department of State Land's fees be accounted for in the cost determinations. Commenters state that Department of State Lands fees need to have a separate line item and point to the discrepancy between EPA and PRP estimates of the percentage of project management costs that the fees would represent.

EPA Response

Department of State Lands propriety authorizations, which include lease fees, were not included in the cost estimates. EPA acknowledges that the State Land Board through the Department of State Lands - promulgated rules for granting and renewal of access authorizations, leases, and easements issued to facilitate remediation conducted pursuant to an order issued by DEQ or EPA and habitat restoration activities in, on, under or over state-owned submerged and submersible land. However, Section 104 of CERCLA, 42 U.S.C. Section 9604 provides the President with broad authority to take response actions determined necessary to protect the public welfare and the environment from releases or the potential threat of a release of hazardous substances or pollutants and contaminants to the environment presenting an imminent and substantial endangerment to public health and welfare.

Section 104(e)(3) specifically provides the President authority to access "[a]ny vessel, facility, establishment, or other place or property where entry is needed to determine the need for response or the appropriate response or to effectuate a response action under" CERCLA. 42 U.S.C. § 104(e)(3). Furthermore, Section 121(e)(1) of CERCLA provides that: "[n]o federal, state, or local permit shall be required for the portion of any removal or remedial action conducted entirely on site, where such remedial action is selected and carried out in compliance with" CERCLA. 42 U.S.C. § 121(e)(1). If EPA were to perform the remedy, the United States would not be required to pay state fees. However, EPA expects most, if not all, of the remedy (cleanup actions) will be performed by PRPs and EPA anticipates that PRPs will negotiate reasonable terms and conditions of access to private and state-owned property to implement the remedy likely will be the subject of future negotiation between the PRPs, landowners, and Department of State Lands. The selected remedy overall is expected to improve the sediment and surface water quality of the river. EPA's selected remedy seeks to minimize land and river use restrictions, while also assuring long-term protectiveness and a cost-effective cleanup. EPA encourages performing PRPs to coordinate with Department of State Lands early during remedial design to negotiate access and find further ways to reduce land and river use restrictions and, if relevant, diminution of property values.

2.22.12 Explain the Selection of the Discount Rate

Comment Summary

Eight commenters stated that they believed that the discount rate that was used in the cost calculations was too high. Commenters state that the 2.3 percent discount rate used by PRPs is consistent with EPA guidance and that EPA's 7 percent discount rate is practically (and potentially legally) unachievable.

EPA Response

As discussed in "*A Guide to Developing and Documenting Cost Estimates during the Feasibility Study*" (USEPA 2000), the real discount (interest) rate used for present value analysis in the feasibility study depends on whether a site is classified as a federal facility site. Federal facility sites are former or current installations operated or controlled by a federal government agency and identified by EPA's Federal Facilities Restoration and Reuse Office. The Site is not a federal facility. In addition, the guidance specifically mentions that although a federal-lead site cleaned up by EPA using the Superfund trust fund (fund-lead sites) may be an analogous situation to a federal facility site being cleaned up using Superfund authority, there is always a chance that a PRP could remediate the site. Thus, per guidance a real discount rate of 7 percent should be used in calculating present value costs for all non-federal facility sites such as the Site. This expectation is documented in the last paragraph of Page 4-5 of the guidance.

The guidance in the second paragraph on page 4-5 also specifically states that any changes to EPA's policy to use a 7 percent discount will be reflected in an update to OSWER Directive 9355.3-20. EPA has not updated that directive, and thus use of a 7 percent real discount rate is still the expectation per that directive. Furthermore, while the statement that a differing discount rate can be considered based on a change to the discount rate within OMB Circular A-94 is correct, OMB has not changed from a 7 percent real discount rate (see Paragraph 8(b)(1) of OMB Circular A-94). Updates to discount rate in Appendix C of OMB Circular A-94 are not considered changes to the policy (see second paragraph on Pages 4 and 5 of EPA guidance (USEAP 2000) and related Footnote 3).

LWG also asserts that a differing discount rate should be used to be consistent with financial assurance practices used for these types of sites that use funding from PRPs. As indicated on Page 1-2 of EPA 540-R-00-002, feasibility study cost estimates are not meant for budgeting, allocation, or settlements. EPA may take a different approach for those purposes, such as indicated in Footnote 3 on Page 1-2. However, that will not be reflected in feasibility study cost estimates where the primary purpose is for comparing remedial alternatives during the remedy selection process.

It should be noted that while EPA used a 7 percent real discount rate for presentation of the alternative costs, a sensitivity analysis was performed for varying discount rates and presented in Appendix N of the feasibility study report (USEPA 2016b). This is consistent with the recommendation in the third paragraph on Page 4-5 of EPA 540-R-00-002.

2.22.13 Be Flexible in Technology Assignment, Current Conditions, and Site Factors Affecting Cost Estimates

Comment Summary

Two commenters requested that EPA show flexibility in technology assignment, current conditions, and site factors affecting cost estimates. Commenters state that site conditions may result in design and remedy implementation costs that may be significantly different than the generic cost estimate contained in the feasibility study report and proposed plan.

EPA Response

The sole purpose of the feasibility study is to develop remedial alternatives to be compared to each other in order to select a preferred alternative for presentation in the proposed plan (USEPA 2016c). The technology assignments in the 2016 feasibility study report (USEPA 2016b) are based on current information about the Site. The report makes specific assumptions based on current conditions to develop remedial alternatives that can be compared to each other to inform remedy selection. Costs cannot be derived in the feasibility study unless a technology is selected and evaluated. EPA used several lines of evidence based on site conditions described in the remedial investigation report to determine the appropriate technology to apply to various areas of the Site. It should be noted that all alternatives (other than the "no action" alternative) used the same types of technology assignments (capping, dredging and disposal, in-situ treatment, ENR, etc.). The difference between alternatives was the selection of a RAL for focused COCs and how that affected the extent and locations of the remedy components identified through technology assignment. The purpose of structuring alternatives in this manner was to understand how selection of a RAL affects achievement of the threshold criteria and tradeoffs in the balancing criteria to select a remedy, not to prescriptively assign a technology to a location. That will be performed during remedial design using the decision tree provided in the ROD.

It should be noted that EPA agrees that maintaining flexibility in construction methods through the remedial design phase is an important consideration, particularly for nearshore areas near structures, area with debris, and areas concerning with slope and structural stability issues. The feasibility study uses representative process options and remedial technologies in order to develop and evaluate alternatives according to CERCLA criteria. The ROD includes a flexible decision tree along with general design requirements to guide the assignment of capping and dredging technologies, based on specific characteristics within SMAs. The decision tree will be used during remedial design to define what actions should be taken under different environmental conditions and locations based on the most recent design data. Once the data and river factors are evaluated within the context of the decision tree, a final design for construction can be completed. This design will then dictate the remedial construction. The decision tree is intended to provide clear direction on what actions should be taken under the different environmental conditions.

Therefore, the specific information associated with SMA footprints, dredging depths, estimated volumes of dredged material and cap material, and thickness of caps and/or types of cap layers are assumptions for purposes of developing cost estimates for the remedial alternatives. These assumptions were developed based on the existing data and will be finalized during the remedial design, after design level data to refine the baseline conditions are obtained.

2.22.14 Ensure Availability of Suitable Capping Material

Comment Summary

One commenter was concerned about the availability of suitable capping materials. The commenter states that EPA's selected remedy will require a large volume of sand for use in capping and for covering dredge residuals during construction and that the cost and availability of capping material is not adequately assessed.

EPA Response

Materials and supplies identified as remedy components for the remedial action are conventional (such as sand, rock, diatomaceous earth, quicklime). EPA has initiated discussions with representative commercial borrow sources in the Portland metropolitan area to determine whether they have the ability to provide and transport (using barges where possible) the required volume of capping and

residual management material. EPA confirmed that commercial suppliers could supply the required volumes of materials need for remedy components. EPA assumes commercial sources of capping materials, and that more than one source may be required for volume and/or material quality needs.

2.22.15 Modify Transloading Costs

Comment Summary

One commenter was concerned about the transloading costs as presented in the cost estimates. The commenter states that important costs associated with constructing a transloading facility are omitted, unreliable, or contrary to EPA's own guidance. The commenter cites specific costs for development, permitting and remediation of the transloading facility.

EPA Response

EPA included a transload facility cost to cover potential needs for transload, depending on the mode of transport used. Specific information on the varying possibilities for transload are discussed in Appendix F of the feasibility study report. The feasibility study makes an assumption that the majority of dredged material for disposal is transported by barge, and that the various pre-treatment amendments as well as dewater removal and treatment would occur on water in barges. Thus, the transload requirements are primarily assumed for off-site transload from barge to other modes of transport to the representative disposal facilities. Because the location of transload is indeterminate at this time, EPA used elements of LWG's transload development costs as representative for potential future transload requirements. The Cost Estimate Backup - Cost Source Database (*WRKSHT NO.: CALC-1, Unit Costs for Transload Facility Development*) of Appendix G of 2016 feasibility study report presents how the unit costs for transloading facility was developed. It should be noted that not all costs from Backup Table 24 was used. Only selected unit costs from this backup were utilized in the cost estimate. Green highlighting indicates unit costs that were used in the cost estimate. As noted in the backup, full development unit cost of $7.5M minus addition of new rail line (~$3.5 million) was used for transload facility development. The 2016 feasibility study report assumes that trucking would be used to transport material transloaded from barges instead of rail. This approach was discussed with representatives from the assumed disposal facilities (ChemWaste and Roosevelt).

As noted in the comment, "*the total estimated construction cost for the transloading facility is $28.5M"*, is a false assertion. As presented in *Appendix G, Cost Estimate Backup – Previously Developed Costs by Anchor QEA*, *Table 24*, $28.5 M is the total estimated cost for "Upland Subtitle D Landfill Disposal". This total estimated cost, apart from Transload Facility Development cost, includes costs for "Materials Handling and Stabilization", "Transportation and Disposal", and "Inspection and Monitoring of Transload Facility."

2.23 Paying for Cleanup

2.23.1 Ensure the PRPs Pay For Cleanup

Comment Summary

A total of 1425 comments were received stating that the PRPs should pay for cleanup. About 60 percent were received as form comments in emails or postcards. The most frequently received of these comments are:

- "Hold polluters accountable for creating a safer Portland Harbor."

- "Entities which have liability for the persistent pollutants in the river sediments must meet their community obligation to conduct a comprehensive and timely cleanup" (or a slight variation).
- "American rivers and streams have been the dumping grounds of polluting industries for decades. I ask that you design and implement a strong cleanup plan for the Willamette/Portland Harbor Superfund Site. Those who have liability for the PCBs, DDT and other pollutants now in river sediments must meet their community obligation to do the right thing and conduct a comprehensive and timely cleanup."

The remainder of the comments were personal statements. Several named one or more PRPs and a common theme was that the companies that had profited from causing the contamination should be made to pay for it. Many people spoke of PRP payment as a deterrent to future contamination.

Representative comments include:

- "We need to hold the companies who made the mess responsible, and hold them accountable for the cleanup, even if the cost is significant. They have made money from the river which belongs to everyone! Now they need to step up to restore it."
- "Polluters like Chevron, Exxon, ExxonMobil, Northwest Natural, and Schnitzer Steel made our river toxic. Now, they should have to clean it up."
- "Responsible parties include some of the biggest industries in Oregon and the world. While some industries complain this will hurt the economy, EcoNorthwest did a study, which determined that every dollar spent on the cleanup of the river generates more than one dollar of economic activity."
- "Make the polluters pay for their dumping. Don't let them off the hook. Do the people right and not the corporations who polluted the river."
- "If businesses who/which deposited the pollution are not required to clean it up, businesses in the future will be incentivized to engage in the same irresponsible behavior. Why act responsibly when you can save money by dumping your mess, collecting huge profits, spending the profits, and then declaring bankruptcy before you are required to pay the true costs of your irresponsible methods? No, the Native Americans are right; the polluters need to clean it all (or mostly all) up NOW. If some of the polluters cannot be held responsible due to bankruptcies or other forms of shunting responsibility, then, as usual, it's up to the taxpayers to pick up the slack and fund that portion of the clean-up. It's the only responsible thing to do, no matter how costly....."
- "I've been a citizen of Portland for 31 years. It appears that most of the contaminants of concern are the type of contaminants that seem to be likely produced by businesses, and yet I'm hearing that the public ratepayers would end up paying some fraction of the cleanup cost. I would guess that you're getting pressure from the business owning PRPs to have the public (in the form of Vera Environmental Services) share this cost for various reasons related to outfalls in the river. As a member of the public I would push back against that and ask that the great majority of the cost, preferably all of it, be assigned to the types of businesses that create the contaminants of concern."
- "Money can't reverse the damage to wildlife but serves as a punishment/deterrent for irresponsible behavior. Entities with liability for the pollution must be held accountable and pay

for a comprehensive cleanup that will protect the health of our communities, our environment, and our wildlife."

EPA Response

The purpose of the proposed plan (USEPA 2016c) was to present EPA's evaluation of remedial alternatives for the in-river portion of the Portland Harbor Site. As required by CERCLA, EPA sought public comment on that evaluation and supporting information to consider in making its final remedy decision. Public comment was not sought on issues of funding the cleanup or liability for paying for cleanup and will not be addressed in any detail in this responsiveness summary. Likewise, the ROD provides the basis for and description of the final selected remedy for the in-river portion of the Portland Harbor Site but does not address issues of liability or enforcement of how the remedy will be implemented. EPA agrees that the parties responsible under CERCLA should pay for the cleanup, consistent with EPA's long-standing "polluter pays" policy. Limited appropriated funds for cleanups are typically used for sites where there are no viable responsible parties. Under CERCLA, EPA searches for parties legally responsible for the contamination and seeks to hold those parties accountable for the costs of investigations and cleanups, by requiring them to perform or fund the necessary investigations and remediation. EPA will follow this approach for the Portland Harbor Site.

EPA continues to support a comprehensive allocation of liability by the PRPs at the Site to facilitate settlements that implement the selected cleanup actions.

2.23.2 Require Performance Bonding

Comment Summary

Twelve comments were received that addressed the issue of performance bonding. Most were individual, personal comments. All of the comments stated that performance bonds were necessary and a few believed they should be required in the ROD. One person suggested a storage tax/fee. The Portland Harbor Community Advisory Group wrote that they wanted bonding assurance that met Superfund guidance.

Representative comments include:

- "Polluters must pay for the cleanup not tax payers PRP need to pay and post-performance bonds."
- "In order to provide the certainty the public deserves, EPA should require some form of insurance or performance bonds to cover the cost of additional remedial action if the adopted plan does not lead to the anticipated or desired results."
- "Performance bonds must be required in the ROD. MNR and capping are proposed in all options, and increase the likelihood of recontamination at some level. If they are the main remediation method relied on as suggested in EPA recommendation, there is a chance of recontamination at a higher level. Therefore, the ROD needs to include the requirement of Performance Bonds and state that any cleanup activity resulting from recontamination must be fully funded by polluters rather than the community."
- "Compliance with the Record of Decision needs to be formally drafted into Record of Decision. The resistance to accepting responsibility for harming the community highlights a need for performance bonds. Funding needs to be guaranteed beyond a one and done perspective to ensure completion of environmental remediation and successful restoration."

- "Assurance bonds/or insurance should be required to pay for any continued and recontamination of the river or need to redo remedies proven to not be meeting goals or through accident. A storage tax/fee should be applied to the PRPs until the toxic materials are gone from the river, adjusted to the level of toxic material in the sediment, with proceeds to go to OR school funds."
- "Performance bonds are part of CERCLA. We want EPA to request legally binding commitment performance bonds from PRPs - since EPA has "no" funds, we want to make sure PRPs have funding designated to future "uncertainties." Funding should not solely be on General Fund tax payees."
- "The CAG wants EPA to certify that "bond assurance" meet the requirements of *Guidance on Financial Assurance in Superfund Agreements* as found in www.epa.gov/sites/production/files/2015-04/documents/fa-guide-2015.pdf."

EPA Response

The purpose of the proposed plan (USEPA 2016c) was to present the remedial alternatives evaluated for the in-river portion of the Site. As required by CERCLA, EPA sought public comment on the evaluation and supporting information to consider in making its final remedy decision. Public comment was not sought on issues of funding the cleanup, including the requirement for performance bonds, or liability for paying for cleanup and will not be addressed in any detail in this responsiveness summary. Likewise, the ROD provides the basis for and description of the final selected remedy for the in-river portion of the Portland Harbor Site but does not address issues of liability or enforcement of how the remedy will be implemented. EPA agrees that the parties responsible under CERCLA should pay for the cleanup, consistent with EPA's long-standing *"polluter pays"* policy. Limited appropriated funds for cleanups are typically used for sites where there are no viable responsible parties. Under CERCLA, EPA searches for parties legally responsible for the contamination and seeks to hold those parties accountable for the costs of investigations and cleanups, by requiring them to perform or fund the necessary investigations and remediation. EPA will follow this approach for the Portland Harbor Site. Typically, it is EPA policy and practice to require financial assurance from parties that perform cleanup work. EPA continues to support that a comprehensive allocation of liability by the PRPs at the Site be accomplished to resolve all claims EPA may have against the PRPs and they may have between each other.

2.24 Flexibility in Implementing Cleanup

2.24.1 Address the Most Contaminated Areas First

Comment Summary

Commenters had divided opinions on whether or not the Site should be addressed as a whole or whether cleanups should be initially targeted at the most contaminated areas. About 75 percent expressed a desire for EPA to be flexible in implementation of the cleanup. Flexibility was often tied to starting with the most contaminated portions of the river first, taking into account changes in the river and site-specifics, and trying lower cost solutions first. Very often, but not always, having separate operable units (OUs) was specified.

Those supporting addressing the most contaminated areas first, possibly through separate OUs, included residents, PRPs, and the City of Portland. Representative comments are:

- "The agency should consider a revision to break up the plan into multiple parallel projects, in order to permit accelerated mitigation on separate elements. If the Port of Portland can address the complex of questions relating to the Swan Island area, lagoon, riparian zone or upland- then

accept the concept of an "operable unit". If the concept of such units is accepted and activated by EPA, there can progress on parallel units, without every element of the plan being delayed by dependence on every other problem or dispute between interested parties at risk."

- "Allow responsible parties to pursue equally protective remedies that get cleanup moving forward soon. I believe the cleanup of the Willamette River offers opportunities for the future of our region. Let's move forward to a responsible solution."
- "Contamination and risks are not uniform throughout the Portland Harbor. Flexibility would allow the cleanup to take into account changes in the river and site-specific risks in a more cost-effective manner."

Requests supporting the use of OUs were longer and generally requested that the Site be address by OUs. This would allow EPA to work with subsets of the large group of PRPs and work on areas that are already well-defined or of lower risk.

Those against the concept of separate OUs seemed to fear that the PRPs would use it to their advantage to negotiate less comprehensive cleanups and that complexities relating to paperwork and regulations would increase.

Representative comments against OUs include:

- "The idea of splitting the Superfund site into separate and independent operating units suggests the possibility that PRP's may apply political pressure to compromise the integrity of the cleanup. Under the oversight and jurisdiction of EPA, multiple sites can be remediated concurrently with all parties observing the same rules of conduct. Cleanup requires a level playing field for all"
- "I oppose the use of separate operable units during this restoration. I believe that restoration can take place on differing timelines in different areas without the complexities and difficulties that the creation of separate operable units will bring to the process."
- We "do not want" to have separate paperwork, analysis, studies, proposed plans or records of decision on this clean up!!"

EPA Response

EPA agrees that maintaining flexibility in construction methods through the remedial design phase is an important consideration. Additionally, EPA agrees that active cleanup technology assignments will be evaluated during remedial design based on new data and area-specific conditions and land uses and other requirements specified in the ROD.

EPA recognizes the desire for the use of OUs or breaking the Site into pieces for remedy implementation at such a large and complex site. There may be advantages to using OUs or other mechanisms for addressing smaller geographical areas for remedy implementation at such a large and complex site. Given the size of the Site, work window constraints, and other considerations, remedial action will be implemented in phases given that collection and evaluation of area-specific information would be conducted during remedial design.

Formal designation of OUs is not critical or necessary to devise a plan how to address the highest risk areas first and sequence cleanup to minimize recontamination of cleaned up areas. EPA anticipates that

much information will be learned in the post-ROD remedial design that will help EPA to determine the most effective approach to sequencing and other aspects of how the remedial action will be implemented. EPA will generally be focusing on having the highest concentration areas addressed first to reduce risk sooner and minimize recontamination to areas cleaned up later.

The entire Site cannot be addressed at one time as a practical matter. However, no matter how the cleanup is phased, implementation of the remedy will not affect the overall integrity and comprehensiveness of the cleanup. We also recognize that some members of the public oppose the use of OUs or other such divisions and EPA wants to assure the public that all viewpoints are being considered; and, if such a decision is later considered, EPA will continue to have public outreach over the design and remedy implementation phases for public participation and input.

EPA has been involved in the development of focused investigations and remedial actions at the early action sites, including Terminal 4, Gasco and Siltronic, Arkema, and RM 11 East, and took these into consideration in development of the remedy. Prioritizing further remedial action at these sites will be considered during remedial design.

2.24.2 Consider Assorted Flexibility Requests

Comment Summary

Requests for flexibility came from the general public, businesses (Arco/BP, City of Portland, ESCO, Exxon Mobile, Geosyntec, NW Natural, Port of Portland, RM 11 East Group, Schnitzer, Siltronic, Swan Island Group, Calbag Metals), and the USACE.

Specific requests include:

- Be flexible in selection of remedial technology.
- Flexibility is needed at a specific location (Swan Island, Gasco, or RM 11E).
- Site-specific toxicity testing is needed to verify model outcomes and design the final remedial action.
- EPA should account for site-specific conditions to ensure early actions are not disturbed or destroyed.
- Modify the technology assignment flowcharts to make clear that flexibility is anticipated.
- EPA should be flexible to adapt to new data and the ROD should explain how the remedy will be implemented when there is a change in structure configuration (dock being removed).
- Use adaptive management principles by selecting higher RALs (Alternative B) so that site cleanup can focus on areas of highest potential risk and establish OUs at those areas. This would enable EPA to refine SMA boundaries, evaluate the effectiveness of remedial approaches and technologies, reduce uncertainties of natural recovery, adjust or refine by ongoing monitoring-adaptive management.

EPA Response

EPA acknowledges that technology assignments will be evaluated based on new data and observations collected during remedial design. The ROD contains a revised, simplified decision tree for selection of remedial technologies during the remedial design process. Compared to the decision trees provided in

the feasibility study report (USEPA 2016b), the ROD decision tree is less prescriptive and demonstrates flexibility for selection of remedial technologies with the assumption that a detailed evaluation of area-specific conditions would be conducted during remedial design. Remedial design investigations will consider prioritization of areas posing highest risk, sequencing, and other aspects of how the remedial action will be implemented. Avoiding disturbance or recontamination of early action areas will be an important part of the remedial design evaluations. Construction of permanent caps will be carefully scheduled to avoid recontamination from upland or in-river work.

EPA is aware that area-specific conditions must be considered during remedial design, including the presence of active docks or other structures, caps and other remedial activities already in place, river uses, and many other considerations. Additional guidelines are provided in the ROD to convey this information.

The feasibility study report states in several places that additional data will be collected during remedial design to assist in refining the remedy beyond the feasibility study-level of analysis and the ROD reflects this as well. EPA intends to evaluate additional data during remedial design to refine the following: delineation of contamination, selection and design of remedial technologies and construction methods, projections of natural recovery, treatment and disposal requirements, measures for aquatic and listed species protection, and compensatory mitigation requirements, to name a few.

EPA does not agree with the use of adaptive management as a way to postpone remedial action implementation or use less restrictive RALs that necessitate greater reliance on natural recovery. The extensive evaluations already conducted, along with the successful use of remedial technologies at other sites, have informed EPA's selected remedy as described in the ROD. Further refinements in the approach will be evaluated in five-year reviews and memorialized in appropriate decision documents.

2.25 Early Action Sites

2.25.1 Coordinate Cleanup with Work at Early Action Sites

Comment Summary

Five commenters expressed concerns regarding work still to be done at the Early Action sites to prevent recontamination of Portland Harbor.

Representative comments include:

- "EPA must use its enforcement authority to force early-action clean-up sites that put the Portland Harbor at risk of re-contamination once in-river clean-up begins."
- "We want a commitment for increased shoreline remedial action. Especially at the Arkema site. We want "more" then management we want control of upland source contamination! We want a legally binding source cleanup form or (DEQ) uplands; we need dates of completion!"
- "More extensive cleanup is called for in river mile 11. The Arkema site and Gasco, as these sites are heavily polluted with persistent toxins which won't be cleaned up with MNR."
- "Re-examine completeness of Early Actions or Hotspot Activities of DEQ. Some cleanup actions have already occurred or were initiated at several areas within the Portland Harbor Superfund Site:

- BP Arco Bulk Terminal. A sediment removal action of the nearshore area adjacent to the BP Arco Bulk Terminal was conducted in 2007-2008 under DEQ oversight. Approximately 12,300 cubic yards of petroleum-contaminated soil and sediment were removed and disposed off site at a permitted facility. The excavated area was backfilled with clean fill and a steel sheet-pile seawall was installed along the entire river bank of the BP Arco Bulk Terminal property. When the remedial design sampling is produced, it needs to include all shoreline; not just the previously examined 20,000 lineal yards but needs to address all 30,000 lineal yards to ensure all contamination is included.

- River Mile 11E Project Area. As the site containing one of the highest levels of PCB's this site should be thoroughly and completely excavated and the contents removed, place on barges and carried to Roosevelt Facility in Goldendale Washington. This and Swan Island has potential for habitat restoration and future human use.

- NW Natural. Please remove all of the tar body and the associated chemicals at the GASCO site and do not just cap it. While it is one of the most devastating sites I believe NW Natural is a needed and important entity to the Portland community and deserves support. EPA, other PRP's and citizens should make every effort to financially support its cleanup for the sake of the citizens, the river and the future. If it takes supporting grants, fundraisers and other activities, the GASCO site should be completely cleaned up but given support so the financial burden is not so overwhelming that it jeopardizes its valuable contribution to Portland.

- Arkema. Arkema is and always has been another devastating site that needs EPA's attention. While it has made little contribution to the citizens of Portland's welfare; the Arkema desperately needs all the effort, time and money that both DEQ and EPA can give it. If left unchecked, it will continue to overwhelm the health of the river for years. U.S. Moorings. Please just test the efficacy of the work that has been started here. Please complete the necessary actions to ensure the sources are controlled completely.

- Triangle Park. Please certify that the University of Portland completes its removal action and other procedures to properly clean up the site to protect human health and the students to be using it in the future. The four main components to the completed removal action included ICs, groundwater monitoring, excavation, and capping.

- Gasco. NW Natural, Siltronic Corporation and EPA signed an AOC for a Removal Action in September 2009. NW Natural and Siltronic are conducting site characterization and design evaluations for the area offshore of their two facilities. They have also agreed to perform further characterization, studies, analysis and preliminary design for the final remedy at the Gasco Sediment site. The studies and other work under the agreement were incorporated into the Portland Harbor remedial investigation/feasibility study. Please confirm that the site excavations and removal of contamination are complete and not just capped or covered up."

EPA Response

During the remedial investigation and feasibility study, EPA entered into agreements with Arkema Inc., NW Natural and Siltronic, Port of Portland, and a group of companies related to RM 11E to undertake early actions in the river adjacent to their facilities. Notwithstanding those agreements (some of which are still in place and others are not) all of the Early Action areas investigated and/or cleaned up under those agreements are included in the feasibility study and are included in the remedy for the Portland Harbor Site that EPA has selected. All of those "Early Action" areas have highly concentrated contamination and need to be remediated. EPA is committed to addressing these areas as early as feasible in the cleanup of the Site. Addressing contamination at the Early Action area as soon as feasible is critical to a successful cleanup of Portland Harbor in order to reduce risks at the Site and prevent recontamination of downstream and nearby areas.

Several commenters expressed concern with the status of and plans for cleanup at Arkema, Gasco, and RM 11E. A significant amount of investigation has occurred; however, with the exception of Gasco, and Terminal 4, no cleanup has taken place as of yet at these Early Action sites. All three areas will be addressed as part of the Portland Harbor Site cleanup. Approximately 15,300 cubic yards of a tar-like material and tar-like contaminated sediment were dredged in 2005 from the river bank and nearshore area adjacent to the Gasco facility and an organoclay mat and sand cap was installed over the dredged area. Dredging and bank work took place at the Terminal 4 site as well.

Under the EPA selected remedy, the following is anticipated at these locations:

- Gasco. Future maintenance dredging adjacent to the facility dock as well as areas in the Federal Navigation Channel. Between the Federal Navigation Channel and the shoreline there is a mix of dredging (including dredging in the footprint of the 2005 tar removal), capping, dredge with cap and a small area of MNR. The remedy for the Gasco river bank will be integrated into the adjacent in-river work.
- Arkema. Future maintenance dredging in the downstream area and immediately downstream of the facility dock (unless it is removed) as well as a small area in the Federal Navigation Channel. Between the Federal Navigation Channel and the shoreline there is a mix of dredging, capping, dredge with cap. The remedy for the Arkema river bank will be integrated into the adjacent in-river work
- RM 11E. Future maintenance dredging adjacent to the project area as well as areas in the Federal Navigation Channel. Between the Federal Navigation Channel and the shoreline there are areas of cap and dredge.

Another comment mentioned a sediment removal action conducted in 2007-2008 at the BP Arco Bulk Terminal where the excavated area was backfilled with clean fill and a steel sheet-pile seawall was installed along the entire river bank of the BP Arco Bulk Terminal property. The request for remedial design sampling on additional shoreline is noted. Under the selected remedy, a combination of capping and dredging is anticipated in the area of the dock located offshore of the BP Arco Bulk Terminal property.

EPA also oversaw upland cleanup activities at the University of Portland's property called Triangle Park as part of a Prospective Purchaser Agreement. The University performed cleanup of that property in 2013 and which is currently undergoing monitoring. EPA oversaw source control studies conducted by

the USACE at the US Moorings site. Based on those studies, the USACE addressed soils deemed erodible into the river. Based on current information, no further upland source control is needed. However, cleanup of sediment adjacent to both Triangle Park and US Moorings is a part of the Portland Harbor ROD.

2.26 Clean Up of Specific Areas of the Waterway

2.26.1 Address Outstanding Issues Sediment Management Areas

Comment Summary

Comments were received from five commenters relating to specific issues with the SMAs as presented in the feasibility study report and/or proposed plan. Those comments are:

- PTW was used inappropriately in development of the SMAs.
- Near-shore sediment sample data should not be separated from navigation channel sediment sample data to develop PTW threshold and RAL contours. This results in the inappropriate delineation of SMA boundaries and consequently calls into question EPA's estimates of dredge volumes, areas to be capped, and costs.
- The SMA used for Alternative I near Kinder Morgan Linnton Terminal is based on a single non-detect for PCBs that happens to be greater than the RAL for PCBs at Alternative I. EPA does not address how non-detects are used in the development of SMAs.
- Sediment data does not support the designation of an SMA offshore of the Shore Terminals facility.
    - DDx. The basis for a DDx-delineated SMA offshore of the facility is unclear since none of the 38 shallow sediment samples collected offshore for the facility contain DDx concentrations that exceed the RAO 5 PRG. DDX should not be listed as a focus COC for sediment offshore of the facility (RM 5W).
    - TPAHs. Only two tPAH samples contained concentrations that exceed the corresponding PRG for RAO 5 and one was taken 19 years ago. The proposed plan should be modified to exclude the SMA offshore of the facility within the RM 5W SDU because TPAH and DDx concentrations in shallow sediment in the SMA do not meet EPA criterion for defining an SMA (greater than 10x the RAO5 PRG) and the SMA is based on widely dispersed and outdated data.
- The basis for SMA Extent in SDU7W is incorrect. There is an unwarranted increase of the sediment remedy area off-shore of Siltronic, driven by non-focus COCs. This area can be minimized while achieving the intended risk reduction by implementing RALs that are more appropriate for non-focus COCs in SDU7W, or by extending SDU6W to include the entire Siltronic shoreline. EPA should not apply Alternative F RALs for non-focus COCs in SDU7W arbitrarily assigning active remedy thresholds that result in estimated post-construction concentrations that are inconsistent with the other areas of the site.
- EPA's proposed SMA area adjacent to the Time Oil facility is unnecessary, because EPA's remedial action objective is already met in all relevant exposure areas. Based on feasibility study report Figure 3.4-10, we understand that EPA has defined this SMA through the Alternative E RALs for 1,2,3,7,8-PeCDD.

EPA Response

Responses to the comments listed above are:

- The values used for PTW as well as the recommendation that EPA should review FMC's food web model report are addressed in the food web model response (Section 2.11.1 of this responsiveness summary).
- The use of additional samples is addressed in the SWAC response (Section 2.7 of this responsiveness summary).
- The SMA near the Kinder Morgan Linnton Terminal is based on the RAL contours from both PCB and PAH samples. While EPA acknowledges that there are non-detects driving the PCB RAL contour footprints in this area, the PAHs footprints for Alternative F and G consist of detected samples and is the predominant contaminant in the area. The sample data presented in the on feasibility study report (USEPA 2016b) was used to best represent the possible area of remediation for estimates of volumes and costs. However, further evaluation will take place during the remedial design to determine if higher levels of contamination are present or not.
- The commenter seems to confuse how SMAs and RALs are defined in the feasibility study report and proposed plan (USEPA 2016c). For each of the focus COCs, a footprint is defining the area where sediment concentrations are above the RAL for each alternative as shown in the feasibility study report (USEPA 2016b) Figures 3.4-7 to 3.4-12. The SMA footprints for each alternative are a spatial addition of each of the COC RAL contour footprints. There is no single SMA defined by RAO 5 PRG and all focus COCs are taken into account when creating SMAs. DDx and PAHs have been shown to be predominant COCs in RM 5W but that does not mean they are the only COCs with higher concentrations outside of the property in question. The primary driver outside of the Shore Terminals facility does seem to be PAHs, of which there are many samples with higher concentrations than the associated RALs for Alternative D, E, F, and G as seen in on feasibility study report Figure 1.2-9a.
- The dispersion and sample dates have been addressed in Sections 2.7 and 2.10 of this responsiveness summary. Further, additional sampling efforts and local evaluation of contamination will take place during the remedial design phase.
- The commenter does not state what the specific "non-focus" COCs are that are driving the asserted increased SMA footprint. The commenter may be referencing feasibility study report Figure 4.1-2 which is incorrectly labeled as showing the focus COCs when in fact it shows the predominant COCs in each SDU as described in Section 4.1.1 of the feasibility study report. The focus COCs are described in Section 3.4.1.1 and all of the focus COCs in this section are used in defining the SMA extent across the entire Site, making it consistent across the Site and not arbitrarily assigned at this area only. The SDUs are defined by the rolling river mile average concentrations of the focused COCs identified in Section 3 of the feasibility study report and are not defined by property boundaries. However, further evaluation at a local level will take place during the remedial design process and actual contamination extent will be identified then.
- The commenter is correct that the small location in question is primarily driven by the 1,2,3,7,8-PeCDD sediment samples. Further evaluation will be done during the remedial design phase in order to determine the actual extent of the contamination.

2.26.2 Correct Contaminant Characterization of the River Banks

Comment Summary

Multiple comments were received from commenters regarding the contaminant characterization of the river bank. They include:

- Figure 19e of the proposed plan delineates shoreline areas around the western and northern perimeters of Swan Island as having known contamination of the river banks. We are not aware of any sampling events producing data showing that the river banks are contaminated in these locations. In fact, much of the delineated shoreline consists of sheet-pile bulkheads that are obviously not available for sampling or remedial action.

- Database included in Appendix A of the feasibility study report is flawed. The data source for river bank contamination is useless for understanding EPA's rationale because the ECSI database is overly broad in content to be used for the purpose of characterizing river banks. Similarly, Appendix A does not include the river bank data compilation. The database offers little to no value for assessing river banks because it is incomplete and has not been subject to any quality assurance review. Errors in the database in Appendix A and data has not been checked for accuracy. Also, Appendix A appears to be a haphazard compilation of various data (or little care was taken to compile the data base), some of which has nothing to do with river banks. A review of the "matrix code" column finds most entries are blank, and many entries are data that are not from river bank soils. If EPA is using the data in Appendix A to make decisions, the data should be subjected to all of the usability criteria attendant to any other data on which EPA relies. Data base is also missing critical information inputs such as sample coordinates, incorrect data, incomplete data set (e.g., middle or southern shoreline.)

- EPA must characterize a site prior to selecting a remedy. At a minimum, characterization includes field investigations and a baseline risk assessment. These studies provide the information necessary to assess risks to human health and the environment and to support development, evaluation, and selection of appropriate response alternatives. The NCP requires that remedies are selected based on consideration of nine criteria, critically including: (1) reduction of toxicity, mobility, or volume through treatment, and (2) overall protection of human health and the environment. River banks were excluded from the remedial investigation; therefore, EPA could not and did not follow this process. EPA needs an approach for river banks that complies with NCP.

- The ROD should identify all contaminated river banks that are identified in DEQ's 2016 Portland Harbor Summary Report. There are concerns that the proposed plan includes remediation of over 19,000 feet of river bank, but the remedial investigation and baseline risk assessments do not provide the necessary information for understanding the nature and extent of the current contamination in the river bank soil. EPA should review Oregon DEQ's most recent Upland Source Control Summary Report where DEQ has identified the presence of uncontrolled river bank contamination and include these river banks in the maps and discussion (such as Crawford Street Corporation cleanup).

- EPA does not have a complete understanding of existing river bank data or prior source control efforts overseen by DEQ. Properties identified in the remedial investigation with river bank contamination do not match the properties presented in the feasibility study report and proposed plan. Properties identified as having insufficient data to make a determination of a river bank

erosion pathway in the remedial investigation report are now listed as properties with "known contaminated river banks" requiring cleanup in the draft feasibility study report and proposed plan, with no explanation. Specific examples are SSI's Burgard Yard, which includes 3,500 data entries attributed to another site at RM 9W, Gunderson's property, and former Mar Com (South) property.

- EPA has misconstrued DEQ's findings identified in the ECSI database. DEQ's findings were not intended to take into account the physical characteristics of the river banks, the locations where contamination was identified along the bank, or the specific contaminants or concentrations detected. EPA's identification of contaminated river banks is incorrect and does not always agree with in-river impacts. Additionally, EPA's characterization of river bank soil contradicts characterization in DEQ's *Upland Source Control Summary Report* (DEQ 2016). EPA has misconstrued a substantial volume of data compiled under DEQ oversight.
- River banks are arbitrarily identified without addressing data, most recent cleanup actions, or delineating where cleanup actions actually begin and end. EPA does not clearly state what it means by including river banks, ambiguously stating that they will be included if "it is determined that it should be conducted in conjunction with the in-river actions."
- River banks are included without clear delineation or sampling evidence. Inclusion of the river banks in the feasibility study report was last-minute and not evaluated in the remedial investigation. Remedial alternatives for river banks were not evaluated in the feasibility study report. The river bank remedy would likely require the removal and reconstruction of buildings, dock structures, underground utilities, railroad lines, and existing groundwater source control measures.
- PCBs are listed in EPA's feasibility study report as a river bank contaminant at a large portion of SDU 7W, but have only been detected in a small number of samples below the applicable screening levels (with one exception, one sample slightly exceeded a conservative bioaccumulative screening level value [ERM 2008; Attachment 2]). Yet, this arbitrary delineation is then carried forward into the proposed plan.
- EPA has no basis for determining river bank soil risks and uses an oversimplified approach by comparing chemical concentration in soil to sediment PRGs. This is inconsistent with EPA's guidance which requires a baseline risk assessment. The PRGs used by EPA for evaluation of river bank soil were established for sediment and potential receptor/exposure pathway relationship for river bank soil are fundamentally different. EPA only identifies two remedial action alternatives: excavate or no action. However, capping and armoring will likely be the preferred alternative for some river banks.
- The facility river bank may not be contaminated, the river bank pathway is incomplete, DEQ has designated the river bank as a low priority.

EPA Response

DEQ determined that two areas of river bank in OU1 of Vigor Marine Ship Repair Yard (formerly known as Portland Shipyard) require source control measures and are a medium priority for source control. The two areas total approximately 1,100 linear feet (DEQ 2016).

The data provided in Appendix A of the feasibility study report (USEPA 2016b) was not used to make design level decisions regarding river bank contamination (see disclaimer included with Appendix A). River bank contamination was characterized by DEQ as part of upland source control and will be further evaluated with adjacent in water work in each SMA per the decision tree in the ROD. The decision tree provides a framework for designing the remedy at specific properties and will utilize new data collected during the decision phase.

Like the upland sources, the river banks are within the geographical boundaries of the Portland Harbor Site and river banks are appropriately included in the selected remedy. During the remedial design phase, each river bank area will be further evaluated to determine if remedial action is needed to comply with the ROD; if additional action is needed, a remedial design will be completed for the facilities' river bank.

The data and information regarding the extent of river bank contamination was provided by DEQ and reviewed by EPA should be representative of conditions described in the 2016 Portland Harbor Summary Report. In response to the City of Portland's comment on the Crawford Street Corporation facility, the Upland Source Control Summary Report (DEQ 2016) described the potential for recontamination as low. Therefore, the facility was not included on Figure 6. But the source control decision for the facility is anticipated to be final in 2018 and river bank soil may need to be addressed. Non-contiguous river banks and SMA will be addressed by implementing SCM on upland river banks before implementing in-river remedies. The final river bank contaminant delineation and the need for an action to address river bank soil will be evaluated during remedial design. The river bank data provided by DEQ and in the administrative record is the most recent data. Additional characterization or monitoring data will be used to make decisions on remedial decision for river banks.

Regarding the comment about data for specific sites (such as Burgard Yard), the river bank data were provided by DEQ. Property-specific river bank data will be collected during pre-design monitoring and will be used to determine the action at each property. Concerns in the final six bullets are addressed in LWG Dispute Issues 1d and 1q (Appendix A of this document).

2.26.3 Clearly Identify the River Bank Remedy

Comment Summary

Comments were received from four commenters regarding difficulties with the identification of the remedy for river banks. Those comments are:

- In the figures associated with the proposed plan, the extent of contaminated river bank does not change regardless of the SMA, which gives the impression that the river banks require cleanup for each alternative (Figures 11a-g (USEPA 2016). However, EPA has also assumed that river bank cleanup is associated with contiguous SMAs, such that cleanup would only occur in river banks that are adjacent to an SMA (Table D2.b). To correct these discrepancies, the depiction of contaminated river banks for each alternative should be consistent with EPA's actual approach defined by that alternative.

- Request that EPA include the basic framework for river bank remedy alternatives evaluation in the ROD. EPA should assess the presence of contamination and stability of river banks; develop remedy alternatives evaluation that acknowledges site-specific constraints. The feasibility study report and proposed plan did not provide a remedy evaluation process for river bank soil.

- The proposed plan is also inconsistent in its treatment of river banks. On the one hand, the proposed plan states that "technology assignments for SMAs adjacent to identified contaminated river banks are extended to include those river banks. Where SMAs are projected onto the river bank, removal followed by capping is the assigned remedial technology." However, EPA's technology decision trees as applied to river banks are inconsistent with the above statement because they appear to require active remediation, regardless of the presence of adjacent sediment SMAs, when PTW is present in the river banks. Specifically, the decision tree for contaminated river banks (Figure 10d in the proposed plan) appears to indicate that if PTW is present in the river banks (even if the river bank is not adjacent to an SMA), river banks will be excavated and then covered with a significantly augmented reactive cap. EPA's decision tree appears to associate PTW with river banks. This is inconsistent with the proposed plan and 2016 feasibility study report, which identify PTW only in sediments. EPA should therefore correct the decision tree for contaminated river banks in the ROD and remove PTW from the river bank decision tree altogether.

- Technology assignments are confusing, vague, and in some cases, contrary to the text of the proposed plan and feasibility study report. Armored portions of shoreline should not be included as contaminated river bank; unclear if river banks with contaminants not listed as RALs will require remediation; river bank technology flow chart designations are inconsistent with technology assignments with shallow sediment areas; technology assignment flow chart for river bank soil does not address highly toxic PTW; EPA's river bank technology assignment flow chart does not distinguish between areas where groundwater may be seeping out of the river bank; EPA has not indicated the depth of contaminated soil that would need to be excavated from contaminated river banks or the slope needed; EPA's river bank flow chart does not indicate that beach mix is required in the capped areas prone to erosive forces; technology assignments for riverbeds are inapplicable to heavily armored portions of the shoreline.

- As recently as February of this year, EPA confirmed this long-standing arrangement not to include river banks as part of the Portland Harbor Study Area in the recent remedial investigation report (USEPA 2016a). At that time, EPA noted that some river banks could be a source of contamination to the Study Area or Site, but stated that "[t]he occurrence and relative importance of river bank contamination is not well characterized for all parts of the study area, but is a focus of DEQ's source control investigations" EPA, remedial investigation report, Section 4.3.4.

- The boundary between the shallow habitat zone and the river bank zone needs to be defined so that a baseline and supplemental design investigation for sediment and the river bank can be defined; definition of the zones would facilitate a remedy, if needed. The upper boundary of the river bank needs to be defined as well.

- The design criteria for restoring the river bank slopes is confusing and will lead to significant misunderstanding by the public and responsible parties during the remedial design. The ROD should not specify design criteria, such as slopes, based solely on potential habitat improvements recommendations from National Oceanic and Atmospheric Administration. It is unclear if EPA is accepting the recommend slope criteria for habitat. Maintaining existing infrastructure should be the priority over ideal habitat for slope. ROD should define performance criteria for river banks.

EPA Response

Recent remedial actions with on-going performance monitoring were not described in the proposed plan (USEPA 2016c) on a site-by-site basis. DEQ's upland SCE information was used to identify river banks with known contamination. If performance monitoring concludes that the remedial action met the requirements of the ROD, EPA may not require further action to be taken to address the river bank.

EPA identified RAO 8, Migration of Contaminated Groundwater, for upland groundwater source control. Groundwater and river bank soil are being treated similarly, as described in the proposed plan; ongoing source control efforts for groundwater and river bank soil will provide additional risk and recontamination reductions.

EPA has included in the ROD an updated decision tree that indicates the flexibility to assess additional data during the design phase to select the appropriate remedial technology to address river bank contamination.

The ROD includes the flexibility for the remedial design to evaluate and select the appropriate remedial technologies. The remedial design will need to address site-specific factors such as highly toxic PTW, depth of excavation, on-site structures, site operations, and other site-specific features.

DEQ identified the extent of river bank contamination, which was presented in the feasibility study report (USEPA 2016b). The site-specific remedial design investigations will delineate the extent of contaminated river banks and physical features, which could impact the selected remedial technology.

Regarding habitat, the boundary between the shallow habitat zone and the river bank and other site-specific features will be evaluated in remedial design in consultation with the Services. The feasibility study made some assumptions regarding river bank slopes (using National Oceanic and Atmospheric Administration criteria), but the river bank slope will be evaluated during remedial design phase and reviewed by EPA, DEQ and will account for services such as overwater fueling to ensure the remedy does not prevent continuation of current services.

For additional information on EPA's approach to river banks, see Dispute Responses LWG 1d or 1q (Appendix A of this document).

2.26.4 Address River Bank PRG or RAO Comments

Comment Summary

Seven comments were received from six commenters regarding PRGs or RAOs associated with the river bank. Those comments are:

- Contaminated river banks are not always contiguous to an area of active remediation, so integrated cleanup of the in-river area and river bank will not occur (i.e., the feasibility study report states on page 4-7 "Contaminated beach areas under RAO 1 are assumed to only be addressed in areas adjacent to SMAs for each alternative"). Please discuss in the ROD how source control will be addressed at these non-contiguous river bank areas to protect the investment being made to clean up the Site.
- Need a decision node for the flow charts that ask if river bank contamination is being managed under state or other regulatory framework (in which this doesn't apply).
- PTW - NRC/NAPL is not applicable to river banks.

- RALs in adjacent sediment should not be applied to river banks. RALS are based on sediment PRGs and are only relevant to in-river pathways, not river banks.
- The PRGs used by EPA for evaluation of river bank soil were established for sediment. River bank soil is not sediment. The potential receptor/exposure pathway relationships for river bank soil are fundamentally different than those for river sediment.
- EPA should not set river bank soil PRGs since they are not based on risk assessments or available data; without risk assessment, EPA does not know the risk river banks pose. Or the recreational beach exposure scenario overestimates exposure and the PRG for river bank soil should be eliminated.
- RAO 9 is not appropriate or a valid measurement of cleanup. Alternatives have a large uncertainty (essentially factor of 2). EPA drawing of river banks on Figure 6 are arbitrary, inaccurate, and overstated and therefore, percentages within the error/uncertainty of analysis. DEQ will require all banks to be addressed under source control; many banks already addressed. Not in anyone's interest to address a remediation area or complete MNR evaluations if upland sources are not addressed.

EPA Response

Regarding the contiguous nature of the river banks, the data and information regarding the extent of river bank contamination was provided by DEQ and reviewed by EPA should be representative of conditions described in the 2016 Portland Harbor Summary Report (DEQ 2016).

Regarding the decision node comment, data will be collected to evaluate river bank contamination. Design details such as the appropriate capping material will be identified during the design phase and will be reviewed by EPA and DEQ. DEQ may oversee river bank cleanup(s), subject to the ROD, that result in an earlier reduction of risk or otherwise advance overall sequencing of cleanup. PTW – NRC/NAPL are applicable to river banks because dissolved river bank contamination can be released to the river.

As described in the feasibility study report (USEPA 2016b) and the ROD, river bank soils may erode or be transported into the river and may become river sediments. Therefore, the PRGs for sediment, which are based on the RI and risk assessment, are appropriately applied to river banks. Post ROD data gathering will be used to develop designs for cleanup and will define the river bank areas that need to be addressed.

2.26.5 Explain Property-Specific Technology Assignments

Comment Summary

Comments were received from Northwest Pipe stating that proposed plan's SDU's inappropriately blend chemicals of concern, principal threat waste areas, and areas where no or limited contamination is found in such a manner that the scores of entities will not be able to sort out their relative potential responsibilities, making the allocation efforts impossible. The ROD needs to specify the quantities of technology assignments within each SDU (or SMA) determined to be appropriate for this complex site and the portion of the remedial action costs attributable to each.

EPA Response

Allocation is not the intent or purpose of the feasibility study report (USEPA 2016b), proposed plan (USEPA 2016c), or the ROD and it will not be addressed in the ROD. Quantities are shown for each remedial alternative based on current information. The quantities for each alternative are based on SMAs as described in Section 3 of the feasibility study report. During remedial design, the information on sediment concentrations, groundwater plumes, reasonably anticipated land and river uses, plus other relevant information to an SMA will be updated for application of the decision tree and determination of where dredging, capping, and ENR is appropriate.

2.26.6 Consider Site Factors that May Impact Implementation

Comment Summary

Comments pertaining to how site factors can impact implementation of remedial technologies were received from four commenters, as summarized below:

- In applying their decision process to select technology assignments at various locations, it appears as though EPA did not consider location-specific factors that would limit the implementation of a selected remedy. The presence of over-steepened slopes, public utilities, piling fields, and other factors all impact the feasibility, cost, and duration of a selected remedy at a localized scale, and need to be considered in the technology assignments.
- EPA must take into account the continued operation of all public utilities in technology assignment and note that some technologies imply may not be implementable with certain existing utilities.
- EPA should identify how the presence of contaminated groundwater impacts technology assignments.
- EPA should acknowledge that areas for active remediation and technology assignments selected for feasibility study purposes will recognize existing upland source controls and will be refined during remedial design and implementation to allow site-specific and new information to optimize remedy effectiveness and reduce uncertainty.
- EPA should state in the ROD that technology assignments will be reevaluated during remedial design in a manner that includes comparative effectiveness using site-specific data and procedures consistent with the Gasco Consent Order (as was completed in the Gasco EE/CA), including current conditions associated with existing upland groundwater source controls.

EPA Response

In general, site-specific details will be considered and addressed during remedial design phase. EPA recognizes that there are existing and planned upland source controls as summarized in DEQ's Portland Harbor Upland Source Control Summary Report (last updated March 26, 2016). Please see DEQ's report and EPA's responses to source control comments in Section 2.27.1 of this responsiveness summary for further discussion of how Site-specific upland controls will be addressed during the remedial design phase.

The purpose of the more prescriptive technology assignment evaluation presented in the 2016 feasibility study report (USEPA 2016b) was not to ignore past evaluations but to provide a consistent and transparent Site-wide evaluation in order to estimate materials and costs to compare alternatives. The technology decision trees in the proposed plan (USEPA 2016c) were not meant to be prescriptive

but simply describe the general evaluation process used to select the remedy. The remedial design phase will entail a more detailed sampling effort to evaluate conditions. The ROD technology assignment decision tree provides a framework with flexibility and the ability to adjust remedial technologies based on more recent property specific information. This flexibility within the design is controlled by specific design requirements that accompany the ROD technology assignment decision tree.

For further discussion on how technology assignments may be impacted by public utilities and contaminated groundwater, please see EPA's responses in Sections 2.21.2 and 2.21.9 of this responsiveness summary.

2.26.7 Explain Technology Assignments for Shallow and Nearshore Areas

Comment Summary

Comments pertaining to technology assignments for shallow and nearshore area were submitted by two commenters, as summarized below:

- Shoreline dredging or capping would be infeasible at the Brix Property. Currently dredging is prescribed for the shallow areas. In addition to relatively shallow water, the structures and piles in the area make sediments in this area largely inaccessible. The removal area consists of native clays to silty clays that provide the base support for the upland slope. Removal of this compact native material at the base of this 2H:1V slope could destabilize the slope. Capping may also hinder access the fuel transfer station at a stationary work barge. The post-construction sediment concentrations are unrealistic and SWACs do not account for dredge residuals or actual background concentrations of COCs. For example, some of the dioxin/furan, PCB, and DDx post-construction concentrations are below EPA's derived background concentrations. Post-construction SWACs less than EPA's arbitrary background concentrations are not feasible and are an artifact of the use of "zeroes," instead of a background or equilibrium-based value, for replacement values in SWAC calculations.

- EPA should consider nearshore mudline/bank slopes and stability in assigning technology assignments. Geotechnical characteristics and submarine conditions limit application of some of the current proposed plan technology assignments. Assigned technologies according to the decision tree outline could result in significant shoreline and bank collapse and create upland structure instability.

EPA Response

The technology assignments in the feasibility study report (USEPA 2016b) are based on remedial investigation data. Footprints of dredging and capping at specific properties will be evaluated on a case-by-case basis during the remedial design phase. The presence of in-river structures, vessel draft requirements, and other location-specific conditions will be evaluated at that time to determine if the technology is feasible or appropriate.

The decision tree in the ROD provides for more detailed evaluations of geotechnical, hydrodynamic, and anthropogenic conditions during the remedial design phase. Appropriate technologies will be used in order to address any potential hazards in the area.

2.26.8 Consider Maintenance Dredging Effects on Technology Assignments

Comment Summary

Three commenters commented that areas subject to future maintenance dredging are much smaller than EPA assumed and that the FMD footprint should be revised, along with navigation depth requirements assumed within the FMD footprint.

Cascade General commented that the water depths in the small boat basin on the western side of Swan Island are currently more than adequate, and there will be no need to maintenance dredge this area for the foreseeable future. Likewise, the two dredge prisms in the dry-dock basin have been stable for at least 20 years, and there is no need for maintenance in this area for the foreseeable future.

EPA Response

The future maintenance dredge areas defined in the 2016 feasibility study report (USEPA 2016b) represented the locations of potential and known future dredge areas based on existing information. The FMD locations will be verified during the remedial design phase. Whether or not a potential FMD location will experience dredging in the future will need to be evaluated at the time of remedial design.

2.26.9 Better Define Habitat Mitigation Requirements

Comment Summary

The City of Portland commented that habitat mitigation requirements under the various alternatives are not described in a meaningful level of detail in the proposed plan or the feasibility study report. The City is concerned that the compensatory mitigation acreage could be underestimated, which could significantly impact cost estimates. Please clarify the calculation of compensatory mitigation acreage in the proposed plan.

EPA Response

Without pointing out a specific flaw in the calculations, EPA is unable to address this question. Table D2.n of Appendix D in the 2016 feasibility study report provides the acres assumed to require mitigation that were estimated for each alternative. Under the selected remedy, 60 acres of compensatory mitigation was assumed, based on armored capping acreages. This includes 2 acres of armored caps to be placed on river banks and 58 acres of armored caps to be placed on sediment in the shallow area, defined as above -15 feet CRD per the NMFS' definition of shallow water.

2.26.10 Provide Technology Assignment Flexibility

Comment Summary

A number of comments were submitted by six commenters that referred to how prescriptive the technology assignments were and requested more flexibility:

- Maintain flexibility in technology assignments so that areas appropriate for compensatory mitigation may be used accordingly.
- Flexibility should be built in for site-specific factors instead of by using generic assignments.
- Technology assignments should be flexible in the amount of dredging and in-place technologies.
- Technology assignments should take into account that the longer it takes to implement the remedy, the longer the impact to the river and fish, and the longer to recover.

- Flow charts need to be flexible to account for uncertainties in the CSM and the application of remedial technologies.
- There should be an evaluation in the suitableness of alternative technologies in effectively reducing or isolating surface concentrations.
- ENR and activated carbon should be considered as active remedial technologies given the high sediment stability of the Swan Island SDU.
- ENR and activated carbon should be considered as active remedial technologies for RM 6NAV SDU
- Consider capping in the Nav-FMD areas where authorized and bathymetric conditions allow.
- EPA should correct the flawed assumptions regarding FMD requirements and propeller wash (propwash) disturbance depths in the Swan Island SDU, and should reevaluate potential remedial technologies within the Swan Island SDU based on these correction assumptions.
- EPA restricted capping site-wide due to a minority of situations. EPA has not presented any site-specific measurements of propeller-induced shear stress or sediment disturbance, instead relying on the presence of scour-pit at a few locations as evidence of substantial risk of propwash to capping.
- EPA does not have any basis to prescribe reactive caps with respect to groundwater flumes nor to specify the type of reactive cap (AquaGate + 10 percent PAC). EPA has failed to address the implementability of its prescribed reactive caps.

EPA Response

To be clearer on the technology assignment criteria and process for implementing the ROD, a new decision tree with associated design requirements are included in the ROD and will provide a framework with more flexibility and other updates as a result of public comment. This decision tree flexibility (relative to ENR, capping, and dredging) is further discussed in Section 2.24 of this responsiveness summary.

2.26.11 Clarify the Decision Matrix

Comment Summary

Comments were submitted by two commenters that referred multi-criteria decision matrix:

- The multi-criteria decision matrix should clarify that cap/cover technologies can be implemented in the Swan Island SDU feasibility study-defined propeller wash areas when site investigation demonstrates that the navigational depth is adequate to resist erosive forces.
- The multi-criteria decision matrix used for technology assessment and scoring provided in feasibility study Figure 3.4-16 is not understandable and not helpful in terms of assignment of technologies. In addition, the simplistic 1, 0, -1 scoring (yes-no approach) is not representative of the relative factors considered during selection of capping versus dredging for a given area. Specific changes to multi-decision matrix were suggested in the first bullet below as part of the suggested changes to flow charts.

EPA Response

The multi-criteria decision matrix was meant to describe the analysis that took place at the Site for cost estimates and volume calculations. Design requirements are specified in the ROD and PRPs may evaluate the site-specific factors to develop their design within the framework of the ROD technology assignment decision tree and design requirements.

2.26.12 Improve Technology Assignment Flow Charts

Comment Summary

There were a number of detailed comments about specific requested changes to the technology assignment flow charts. Recommendations for the flow charts were:

- The inclusion of multiple criteria that include pre-remedial design studies, geotechnical considerations, detailed sediment stability and propeller wash analyses, site-specific waterfront features, spatial differences in the river characteristics, and updated sediment and fish tissue concentration sampling data
- Having performance-based application of any reactive residual layer (e.g., flow chart requires placement of reactive residual layer regardless of post-dredge sediment conditions)
- Consideration of site-specific chemical and physical conditions in determining the need for reactive materials or armoring of caps
- Capping in navigation channel if authorized navigation depth could be accommodated
- Partial dredge and cap in NAV/FMD areas where bathymetric conditions would allow
- Use of alternative technologies, such as in-situ remediation or ENR where physical site constraints preclude placement of cap materials under structures
- Creating a single unified flow chart for Swan Island
- Specific notations on changes to wording in the flow charts

Related comments specific to Swan Island include:

- Use the intermediate decision trees when FMD area bottom depths are adequately below navigational depth
- Apply a mix of remedial technologies within the RAL footprint
- Apply ENR or MNR in the remainder of the Swan Island SDU outside other RAL footprint
- Conduct monitoring programs to assess performance and recontamination potential

EPA Response

There were a number of detailed comments about specific changes to the technology assignment decision trees. EPA has noted the suggested changes to the decision trees and has revised the charts into one final decision tree included in the ROD. There was a misunderstanding about the decision trees intended for the propose plan as the prescriptive ones presented used were prepared for the 2016 feasibility study report (USEPA 2016b). EPA has developed a less prescriptive approach for the ROD that provides a framework, including design requirements that will be followed during the remedial design

process. This approach should address the specific comments about wording and flexibility in applying technology assignments at a site-specific level.

The Swan Island SDU recommendations are mostly incorporated already into the previously proposed technology assignments in the 2016 feasibility study report and proposed plan (USEPA 2016c). There will be a mix of remedial technologies based on location-specific features and ENR or MNR will be applied outside of the RAL footprint. The decision tree in the ROD provides a framework for design requirements and final technology design will decided through the remedial design process and requested. Monitoring will occur at this time and after remedial technologies are placed to track short-term and long-term performance.

2.27 Source Control and Sediment Recontamination

2.27.1 Ensure Source Areas Are Controlled

Comment Summary

A total of 1389 comments were received on this topic. Almost all (98 percent) were received as form postcards or emails. The most common of those form comments are:

- "EPA's cleanup plan should include the heavily contaminated uplands as well as the heavily contaminated river" or a slightly modified version.
- "Require the state of Oregon to continue upland sources control via legally enforceable means; the current text indicates that this approach "May" be taken."

Several personal comments were received expressing concern about the status of upland source control and the split of responsibility between DEQ and EPA to address ongoing upland sources of contamination. One person believed that giving DEQ responsibility for upland and upriver sources meant that sources would not get addressed completely because DEQ has fewer resources than EPA. One person believed that DEQ's method of identifying sources was insufficient and that DEQ (and so EPA) does not have a clear idea of where all the significant sources are. Representative personal comments include:

- "It seems reasonable that the upland contributors to river contamination should be cleaned up prior to actual river cleanup. Sadly, since DEQ is the lead agency on upland source cleanup, I don't expect that to happen any time soon. The DEQ is chronically underfunded, understaffed, and not empowered to make industry complete cleanups in a timely matter."
- "EPA should require the State of Oregon to continue its measures to control upland sources via legally enforceable means. Unfortunately, the approach suggested in the draft proposal indicates that such an approach may be taken and does not require it; we do not believe that language is sufficient."
- "You can't just clean up the river in the Portland downtown area and expect that to resolve the issue. The problem starts upstream from there in Newberg where they're pulling out three-legged frogs and all kinds of crazy things. That's an area that's highly contaminated and that water flows downstream to Portland. Cleaning up the water that is coming into the river is what's going to flush contaminates from the Willamette."

- "It is true that there are hot spots of contamination that need to be addressed. It is also true that there are considerable volumes of fresh contamination currently entering the Portland harbor, not only from the local area, but upriver, beyond the Superfund site, from the hundreds of square miles drained by the Willamette and its tributaries."
- "The upland sources, particularly the tank farms located in Linnton/Willbridge area, need to be controlled to prevent further contamination or recontamination of the river, with specific attention to earthquakes, flooding and climate change."
- "Control of upland and upriver sources is necessary and not complete. The plan indicated a more pervasive influx of contaminant from the sources on land, many or all of which are uncontrolled. This problem must be remedied with source elimination in the harbor and source control upriver."

Extensive comments were received on source control from numerous businesses, the USACE, and the Audubon Society. They are too large to quote directly and are summarized below:

- Several parties (ExxonMobil, Sediment Management Working Group, the USACE, PCI Group and the Audubon Society) believed that source control should be in place prior to remedy implementation.
- The Audubon Society asks that the previous cleanup work performed at early action/hotspot locations and the McCormick & Baxter site be re-examined for consistency with the RALs and PRGs for the Portland Harbor Site.
- The Associated Oregon Industries request source control and natural recovery processes already occurring in Portland Harbor be acknowledged as well as DEQ's role in the Portland Harbor source control program since the Propose Plan and appears to be written to allow EPA to take over state-led work.
- The USACE included a specific request that groundwater source control be in place for the NW Natural plumes (Gasco) prior to remedy implementation in the relevant SDU that is adjacent to the NW Natural facility and U.S. Moorings facility.
- Siltronic Corporation requested that upland source control (especially as it relates to a remedy for NAPL) be in place prior to remedy implementation at the Gasco location.
- NW Natural requested that source control work completed at Gasco be acknowledged and utilized in the feasibility study and proposed plan in development of the preferred alternative. A similar comment from LWG asks that EPA not prescribe sediment remedies that ignore completed or committed upland source control measures.
- Comments from ExxonMobil, the Swan Island Group and the PCI Group ask that recontamination assessments be performed prior to remedy implementation.
- A comment from ARCO and BP West Coast Products notes that the natural movement of PAH-contaminated sediment from the Gasco location will recontaminate downstream areas.
- Comments from the Port of Portland and The Marine Group and BAE express concern that the 9 ug PCB PRG is unattainable in Swan Island Lagoon due to recontamination potential from urban background stormwater contributions.

EPA Response

EPA is committed to ensuring that upland and upriver contaminant sources to the Willamette River are controlled because source control is critical in achieving the remedial action objectives for the Portland Harbor cleanup. In a February 2001 Memorandum of Understanding (MOU) (USEPA 2001), it was agreed that EPA would take the Lead Agency role and DEQ would take the Support Agency role for the in-river cleanup while DEQ would take the Lead Agency role using state authorities and EPA would take the Support Agency role for addressing upland and upriver contamination that may impact the Willamette River. EPA and DEQ jointly developed the December 2005 Portland Harbor Joint Source Control Strategy (DEQ 2005) to address the issue of uncontrolled upland and upriver sources of contamination to the river. The strategy provides the framework that DEQ follows in making upland and upriver source control decisions and provides the technical approach for characterizing upland and upriver sites and conducting source control evaluations for them.

Under the MOU, DEQ has coordinated their proposed source control decisions with EPA, six federal recognized Tribes, National Oceanic and Atmospheric Administration, Oregon Department Fish and Wildlife, and the U.S. Department of Interior. DEQ and EPA have coordinated even more closely on more complex upland sites, such as NW Natural and Arkema. Since the achievement of cleanup levels identified in the selected remedy relies in part on timely and successful completion of these upland and upstream source area actions, EPA retains the discretion to use its federal authorities to complete those actions. See Section 2.37 of this responsiveness summary for EPA's response on agency roles and cooperation. The Joint Source Control Strategy requires DEQ to prepare Milestone Reports. These reports provide an updated schedule and status of DEQ efforts to identify and control sources of contamination. Regular meetings are held between EPA and DEQ to discuss upland site source control decisions. EPA reviews and comments on most of DEQ's proposed source control decisions.

The status of the upland source control under the Joint Source Control Strategy framework was summarized in DEQ's Portland Harbor Upland Source Control Summary Report (DEQ 2016), dated November 21, 2014 and updated March 26, 2016. At the time of the updated report, DEQ had identified 495 commercial and industrial properties within the upland area, and of these sites, DEQ screened 171 sites for further evaluation. DEQ's goal is to control all upland sources prior to the initiation of in-river cleanup. The overarching goal of the Joint Source Control Strategy includes completing upland source control to the extent practicable prior to sediment cleanup in the Site. For example, a hydraulic control and containment system was installed at Gasco to capture and treat groundwater before it reached the Willamette River. EPA and DEQ are currently evaluating monitoring data and groundwater model flow predictions to determine if Gasco contaminated groundwater has been controlled sufficiently to begin in-river cleanup. A groundwater source control decision is expected from DEQ prior to remedy implementation near Gasco. Remedial design for the Gasco remedy will account for any NAPL (also known as Substantial Product) present in sediment. Source control work will be factored into remedial design (see also Sections 2.24 and 2.26 of this responsiveness summary).

Upland sources have been identified along the downtown reach of the river (approximately RM 12 through 16) that DEQ is working with to control and sediment contamination also exists within this reach. DEQ will be working with responsible parties at contaminated sites in the downtown reach of the Willamette River to ensure that the upland sources are controlled and the sediment contamination is addressed so that recontamination will not occur in areas subject to this ROD.

DEQ has placed regulatory controls on facilities to protect the water quality of the Willamette River from discharges of pollutants to the river. Most discharges of pollutants to the river require a NPDES permit under Oregon's authorized Clean Water Act Section 402 program. NPDES permits require dischargers to meet state water quality standards and total maximum daily loads (if applicable) in order to support all designated and potential beneficial uses. Periodic sampling is required under NPDES permits to ensure that discharges are in compliance with pollutant limits. Other regulatory controls related to bulk fueling facilities include the requirement to prepare and update spill prevention, control, and countermeasure plans to protect waters of the state from a release at facilities with petroleum storage.

In the selected remedy for the in-river cleanup, EPA has included remediation of a number of contaminated river banks immediately adjacent to sediment management areas that are documented uncontrolled sources of contamination to the Willamette River (see also Section 2.37 of this responsiveness summary).

Cleanup sequencing will be important for areas where a final sediment cap is installed as inputs from adjacent upriver cleanups will have the potential to recontaminate clean areas. As an example, cleanup of the area of the Willamette River offshore of Gasco should commence prior to areas in the downstream vicinity. A monitoring program will also be implemented to evaluate the long-term effectiveness of the remedy (Section 2.17 of this responsiveness summary). While source control efforts will be required permanently and serve to minimize the potential for recontamination, the monitoring program will be used to identify areas where recontamination may be occurring. Refer to the Section 2.3 of this responsiveness summary for a discussion of the feasibility of achieving the PCB cleanup level in an urban waterway such as Swan Island Lagoon.

Recontamination assessments are a component of pre-design or remedial design activities. The objective is to consider and evaluate upland, river bank, and in-river sources of potential recontamination and determine whether they were adequately investigated and controlled. See also the Sections 2.3 and 2.17 of this responsiveness summary regarding responses to concerns with unrealistic cleanup goals due to ongoing sources such as upstream inputs.

2.28 ICs

2.28.1 Develop a Plan for Implementing ICs

Comment Summary

Comments were received that stressed the need for EPA to develop a plan to implement ICs so that the public would be clear on the risks, the process involved, and the results.

Representative comments include:

- "We request that the 5-year plan describe how the results of monitoring could impact fish advisories both Site-wide and on a more localized scale, and how these results will be communicated to the public to inform the community about progress being made in the river cleanup."
- "EPA should explain how it intends to ensure that Institutional Controls are effective to prevent human exposure to contaminants. Include regular health screenings and provision of necessary medical treatment for vulnerable populations that may be affected by consumption of contaminated fish. Include strategies to conduct aggressive target outreach in the event of a spike

in toxicity levels in fish tissue, water column, sediments or air in which the public is likely to have exposure."

A similar topic is addressed in environmental justice (Section 2.35.3 of this responsiveness summary).

EPA Response

Effective ICs are key component of reducing risk at the Site and are critical to the successful implementation of the cleanup plan. EPA knows that many Tribal and community members fish for recreation, sustenance or because of long-held cultural traditions. EPA understands that issuing a fish advisory and posting warning signs may not be sufficient by themselves to adequately inform the public about risks at the Site.

During remedial design, the PRPs will develop an IC implementation and assurance plan (for review and approval by EPA) that lays out the approach for the development and implementation of all ICs required by the ROD to protect humans from exposure to site contaminants and to protect the remedy put into place. Specifically, the use of fish consumption advisories and regulated navigation areas, and the entities responsible for implementing them will be outlined. Additional IC mechanisms may be developed during remedial design, as needed.

The primary goal of the IC implementation and assurance plan is to establish and document the activities necessary to implement and ensure the long-term stewardship of ICs, and specify the persons and/or organizations that will be responsible for conducting these activities. In development of the plan, EPA will coordinate with river users, property owners, communities and other stakeholder groups to minimize the long-term impacts of ICs as part of the remedial action. The IC plan will include permitting aspects for ongoing maintenance throughout the area in this selected remedy as well as the downtown reach as well.

The approach for the fish consumption advisory IC will likely include, but not be limited to, the following:

- Survey fisher communities, including Tribal, low-income, minority, and immigrant communities, to verify the fish species being consumed, consumption rates, preparation and cooking practices.
- Develop a fish tissue sampling plan including species, numbers, and size of fish to be sampled, as well as tissue surrogates, such as passive sampling devices, where needed.
- Use fish tissue and other empirical data to support the five-year review process in evaluating the relative success of remedial measures against RAOs.
- Collect fish tissue data during remedial design (baseline) and throughout construction as part of the comprehensive monitoring plan for the Site.
- Establish fish consumption advisories that are fully protective of human health throughout construction and following construction based on on-going monitoring of fish tissue samples from upstream, within, and downstream of the Site.
- Conduct outreach and education tailored to the affected communities to ensure that fish consumption advisories are effective and appropriate, advisory signs are designed, installed, and maintained effectively and at the appropriate locations, in coordination with Oregon Health

Authority and Multnomah County Department of Health. Programs such as the education collaborative at Palos Verdes will be considered in development of the IC implementation and assurance plan.

- Identify and educate fisher communities about mechanisms to reduce the impacts of fish consumption advisories. The Agency for Toxic Substances and Disease Registry and/or Oregon Health Authority will review fish consumption information from EPA in their health assessment process, and offer health screenings if appropriate.
- Include coordination with sport or recreational fishing clubs and licensing locations
- Monitor the effectiveness of fish consumption advisories through surveys of fisher communities during construction.
- Based on long-term monitoring as determined in the five-year review process required under CERCLA, re-evaluate fish consumption advisories to ensure they are fully protective but not overly restrictive and on target to meet long-term goals of the remedial action. This may include special consideration of high use areas such as beaches and fishing areas at Cathedral Park, Willamette Cove, and Swan Island Lagoon.

2.28.2 Incorporate Education of the Public into Fish Consumption Advisories

Comment Summary

About a dozen comments were received that were specific to educating people on risks from fishing so that they would be aware of and would heed the fishing advisories. It was pointed out that people currently fish at the Site even though fish advisories are in place (such as warning signs at the river). Commenters believe that a more robust public education effort would have to be used to ensure that impacted communities were aware of the health risks and the acceptable amounts of fish that could be eaten. One commenter has expertise specifically in Russian and the local Russian community and highlights the preference of this culture and community within Portland Harbor to fish and eat fish from the river.

Representative comments include:

- “The City requests that EPA address the feasibility of easing fish advisories for small home-range fish species in localized areas when the monitoring data indicate that fish caught from these exposure areas have recovered enough to do so.”
- “People still fish from the water and don't understand the adverse health effects. Warnings are posted in several locations, but they aren’t everywhere. I would guess that a majority of the people I see are immigrants and need the fish they catch to feed their families.”
- “It is important that a better job is done with this clean up. Portland has a huge homeless population and many live on or near the river. These people are not reached through traditional outreach. These people and all Portlanders deserve to be able to use the resources that the Willamette offers. We need EPA to make sure that all people, not just healthy adults, can use the river and eat fish from the river.”
- “I'm an interpreter, translator, and I've worked with the East European Coalition … and I'm here today because I know that the East European Coalition has a small grant aiming to engage and

inform the Russian speaking community, the East European community so to speak, multiple languages beyond Russian about this and I happen to know how common it is for Russians to go fish in the Willamette. I also have photographs that show multiple languages warning not to eat the fish out of the Willamette in four or five languages. So I'm eager to see that the broader community gets engaged in this project and is well informed both in terms of language, in terms of opportunity that they can participate, they can be informed to protect their own health but also how they can render development to their own community."

- "To help the public better understand the fish advisories, please describe the reasons for the differences in advisories from the different agencies. The City also encourages EPA to partner with Oregon Health Authority in developing a means to communicate this process to the public. Please revise the communication strategy for EPA advisory so that it is more meaningful to the public. Due to the high reliance on fish advisories at the Site, the City would like EPA to perform a study to assess the effectiveness of fish advisories, to ensure they are successful in protecting the public."

EPA Response

Since the Site was listed in December 2000, EPA has conducted continuous outreach efforts and has engaged with organizations representing people who live along the river. Recent outreach activities are outlined in EPA's most current iteration of the Portland Harbor Community Involvement Plan, which is available on EPA's Portland Harbor Superfund website. EPA intends to continue these outreach efforts after the release of the final cleanup plan for the Site.

EPA recognizes that fish consumption advisories are challenging ICs to implement effectively without community support. EPA will work with the PRPs, tribes, community groups, appropriate state agencies (such as the Oregon Health Authority) and other parties to develop an education program for fish advisories and any other ICs that is specifically tailored to those most at risk (such as those who consume the greatest amount of fish such as tribal members and communities with environmental justice concerns). We will also draw on experience at other Superfund sites to improve on what works and avoid what does not. We will pay particular attention to understanding cultural nuances and overcoming communication issues and will rely heavily on advice from the Tribes and communities with environmental justice concerns in making this happen.

The outreach program may include informational meetings, presentations, and workshops targeting affected community groups; development and distribution of informational materials such as brochures or maps; advisory notifications communicated through a variety of culturally appropriate outlets; installation and maintenance of advisory signs at known fishing locations; and coordination with sport or recreational fishing clubs and licensing locations. This level of effort is specified in the ROD (Section 14), and it will be a priority in implementing the cleanup at the Site.

The five-year review will address the effectiveness of the ICs in evaluating protectiveness and EPA will also evaluate the feasibility of easing fish advisories as specific areas recover. EPA will also revise the communication strategy for the EPA advisory so that it is more meaningful to the public and will discuss the potential to perform a study to assess the effectiveness of fish advisories with the City of Portland.

EPA agrees that all areas that provide recreation, fishing or other public uses, including high-use areas such as beaches and fishing areas at Cathedral Park, Willamette Cove, and Swan Island Lagoon, should be given appropriate RAL assignments to limit exposure as quickly as possible through the

implementation of the appropriate remedial technology. During remedial design, EPA will further consider site-specific factors, including high public use, in prioritization of areas posing the highest risk, sequencing, and other aspects of how the remedial action will be implemented.

RAO 2 (protection of human health) will not be met until several years following construction, requiring fish consumption advisories at the Site and watershed-wide fish consumption advisories, such as the existing Oregon Health Authority advisory for mercury, would likely remain in place because there are sources of contamination that are outside of the scope of the Superfund cleanup. EPA acknowledges the need for improved risk communication regarding the acceptable fish meals (compared to the existing Oregon Health Authority fish advisory) and the timelines to meet RAO 2. However, given that this is a large and complex site, it is difficult to estimate the time to conduct the remedial design. The implementation of the selected remedy will dictate how the design will be conducted. It is unlikely that design and construction activities will be conducted in a single phase. Therefore, part of the post ROD activities will include remedy implementation planning. This work will be conducted and coordinated with stakeholders. EPA will continue to conduct community involvement activities that will keep the community and stakeholders engaged in the process and involved in the cleanup activities.

2.28.3 Reduce Use of ICs in General and Monitor Carefully

Comment Summary

Twenty-five comments were received relating to the effectiveness of ICs. People asked that the use of ICs be reduced where possible; and, where not possible, that measures be developed and implemented to ensure their effectiveness and make changes where needed. They requested that funding be set aside for evaluation and changes.

Roughly 85 percent of the comments were form email comments that stated:

- “Because Institutional Controls (ICs) are not effective, especially in the long term, EPA needs to reduce the need for ICs, and include in the ROD provisions for PRPs covering the costs of ICs, and provisions for evaluating the IC effectiveness with regular program modifications.”

The remaining comments were:

- “ICs do not work according to GAO. Therefore, cleanup goals should eventually eliminate use of ICs.”
- “ICs are not effective, especially in the long term. When ICs are utilized the potential responsible parties must cover the costs of these ICs for their duration, and provisions must be included for evaluating their effectiveness with regular program modifications.”
- “It is misleading to omit discussion of the ongoing need for fish advisories and the role, if any, that fact plays in EPA’s remedy selection.”
- “Please also reduce the need for ICs, and include in the "records of decision" provisions for "potentially responsible parties" covering the costs of any ICs that are implemented, as well as provisions for evaluating the IC effectiveness with regular program modifications.”
- “EPA states that existing fish consumption advisories might not be sufficiently effective in protecting human but does not propose an alternative fish advisory that should apply between now and the start of cleanup, which may be many years from now.”

EPA Response

ICs are common components of CERCLA remedies to help prevent exposure to residual risks and protect remedies put into place. Over the years, EPA has improved its implementation of ICs to assure they are reliable in the long-term and EPA does not believe that ICs in general will be less effective at Portland Harbor than other cleanup sites. That said, EPA agrees that for ICs to be effective, EPA, the state and PRPs all will have a role in implementing, monitoring and enforcing ICs used at Portland Harbor.

Regulated navigation areas are a type of IC that ensures the integrity of sediment caps is maintained. Regulated navigation areas limit river activities in specific areas and could include prohibiting anchoring of vessels or the use of spuds to stabilize vessels in areas containing caps. Notifications such as signs and buoys may be used to warn vessels from the area. Other ICs may not include buoys, but may involve adding notation on navigation charts for areas that require coordination with EPA prior to dredging or other harbor maintenance work. Regulated navigation areas have been successfully used in the past to protect remedial actions at the Site and were required to protect the McCormick and Baxter cap and the Gasco interim action cap from vessel activities. Periodic inspections of regulated navigation areas notifications will be needed to ensure they are functional and effective. The IC implementation and assurance plan, to be developed during remedial design, will outline the approach for effective implementation and monitoring of regulated navigation areas (Section 2.28.1 of this responsiveness summary).

Other land use restrictions may be implemented through easements or other real property mechanisms. All ICs will be monitored and if found to not be working, additional or different controls can be applied or additional cleanup may be required.

EPA explained the need for fish consumption advisories in both the feasibility study report (USEPA 2016b) and the proposed plan (USEPA 2016c) based on the results of the BHHRA (Kennedy/Jenks 2013) in the remedial investigation report. EPA has clearly identified in the ROD the need for fish consumption advisories during and after construction of the remedy until cleanup levels are achieved. Even then, watershed-wide fish consumption advisories such as the existing Oregon Health Authority advisory may need to remain in place because there are sources of contamination that are outside of the scope of the Superfund cleanup (upstream sources of naturally-occurring mercury).

As described in Section 2.28.2 of this responsiveness summary, EPA acknowledges the challenges of fish consumption advisories and ensuring, the public is aware of the risks to eating resident fish and abides by the advisories to limit their consumption. That is one reason why EPA's remedy decision has sought to address as much risk through active cleanup as feasible and cost-effective. The objective of the remedy is to reduce contaminant concentrations in a variety of media mainly by actively targeting the sediment areas with the highest known concentrations of contamination and areas with contaminated groundwater impacting the river. This active remediation is expected to reduce fish tissue concentrations and associated human health risk and reduce the reliance on fish advisories. However, it should be noted that fish consumption advisories will remain no matter how well contaminated sediments and other media at the Site are remediated due to sources of contamination that are outside of the scope of the Superfund cleanup, as explained in Section 2.3.3 of this responsiveness summary.

Fish tissue monitoring is a part of the monitoring plan for the cleanup, as described further in Section 2.17.3 of this responsiveness summary, and parties responsible for the cleanup will also be responsible for funding the implementation of the monitoring plan. Monitoring data will be used in part to determine whether fish consumption advisories can be relaxed. During remedial design an IC

implementation and assurance plan will be developed by the PRPs for review and approval by EPA (Section 2.28.1 of this responsiveness summary), which likely will include a variety of ICs, some of which PRPs will implement and others will be governmental controls implemented local, state, and federal agencies with authorities to authorize uses of the river.

Regarding the commenter's statement that EPA claims that existing fish consumption advisories might not be sufficiently effective in protecting human health but has not proposed an alternative, fish consumption advisories are a state-led function and issuing an alternate advisory in a Record of Decision is not appropriate. However, EPA has taken and will continue to take action by conducting extensive outreach efforts, including coordinating with the Oregon Health Authority and Oregon DEQ to inform particularly vulnerable communities of risks associated with contamination in the river. One example of these outreach efforts specific to fish consumption advisories began in 2012 when EPA the Willamette Riverkeeper, the Oregon Health Authority, and the Department of Portland Parks & Recreation worked with different groups such as the Portland Harbor Community Advisory Group, five neighborhood associations and representatives from the Slavic, Latino and Vietnamese communities and the Yakama Nation to review the previous fish advisory sign in order to design a more useful sign. Multiple focus group sessions occurred with these community and tribal partners in addition to extensive meetings between Oregon Health Authority and EPA. The result of this extensive outreach was a revised fish advisory sign that incorporated community and tribal input.

2.29 Remedy Compatibility with Current and Future Use

2.29.1 Prevent Conflict with USACE Dredging

Comment Summary

The USACE believes the scope of the Site cleanup interferes with its critical missions and should address only SMAs defined in the proposed plan. For USACE projects outside of SMAs, an existing guidance - the SEF and implementation process - through the Portland Sediment Evaluation Team should continue to be used to evaluate contamination levels and manage sediments removed for maintenance dredging purposes within the Federal Navigation Channel as well as by other project proponents (such as the Port of Portland).

USACE believes that the existing SEF will continue to allow unconfined aquatic placement of dredged material (such as disposal upstream of the Site or in the Columbia River flow lane) while the application of the PRGs will preclude it. They commented that the geographic scope of the application of PRGs needs to be clearly defined and is concerned if the PRGs are applied up to Willamette Falls (RM 26.8) and commented that if PRGs are applied to RM 28.4 that could result in the removal of a valuable resource from the Lower Willamette and Columbia River Systems. They believe that the preference of the NMFS would be that dredged material from the Site meeting the SEF could be disposed unconfined upstream of the Site and in the Columbia River.

EPA Response

USACE appears to be most concerned about the PRGs associated with the human health fish tissue and sediment goals and did not provide specific information about the SEF nor any quantitative support demonstrating why under that framework sediment evaluation, particularly for bioaccumulative toxics, would result in significantly different results from the CERCLA evaluation of risk and disposal options. The SEF (in Sections 8 and 9) provides for assessing bioaccumulative contaminants and where appropriate undertaking site-specific risk assessments which in the case of the State of Oregon would be using DEQ's cleanup program's risk assessment guidance. Thus, it is not clear why decisions under the

SEF as applied would be significantly different, especially once bioaccumulation values have been developed for use in the SEF.

PRGs for Portland Harbor were developed in compliance with the NCP and EPA guidance to reduce unacceptable risk to people and ecological receptors determined through site-specific CERCLA risk assessments. The PRGs represent concentrations in environmental media which are protective of both human and ecological receptors for each RAO for the cleanup. The PRGs were developed on the basis of site-specific and default risk-related factors, chemical-specific ARARs, and consideration of upstream sediment background concentrations. The sediment background concentrations were derived from data taken as part of the remedial investigation and were developed in accordance with CERCLA guidance. In making CERCLA remedial action decisions, EPA must apply the CERCLA statutory and regulatory standards.

Under CERCLA's standards, the entire in-river portion of the Site presents unacceptable risk to people and wildlife consuming resident fish from bioaccumulation of PCBs chlorinated dioxins, DDT and metabolites in fish tissue, which includes areas outside of SMAs. Beyond site-wide fish consumption risks, risks to the benthic community as measured through comparison to site-specific and national sediment quality guidelines are present throughout the in-river portion of the Site. The final remedy selected monitored natural recovery for areas in the Navigation Channel and other areas that may need future maintenance dredging outside of the SMAs. Monitoring will occur in those areas and, if MNR is not occurring, more active remediation may be needed.

EPA and the USACE have a Letter of Agreement on coordinating USACE dredge projects with the EPA cleanup program. We anticipate continuing to work with the USACE under that Letter of Agreement post-ROD. However, with the final ROD issued, EPA anticipates that future maintenance including dredging within the area covered by the selected remedy and downtown reach, will be evaluated consistent with the final ROD and cleanup levels for purposes of evaluating both what contaminant concentrations may be exposed by the dredging and making decisions regarding where the dredged sediment can be disposed. Sediment containing COCs exceeding PRGs in areas outside of SMA's needs to be managed consistent with EPA's ROD to minimize discharges of contamination during dredging and exposure of contamination as a result of the dredging and disposal that poses unacceptable risk. EPA will continue to perform a supporting role to the USACE in review of permit applications for projects in Portland Harbor under Section 404 of the Clean Water Act to ensure adequate project controls are in place during in-river sediment disturbing activities.

With regard to dredged sediment from the Site and the potential for unconfined disposal in the Columbia River, based on current information and EPA's risk assessments, EPA could not sanction the placement of CERCLA dredged material in the Columbia River that exceed human health PRGs or any of the ecological PRGs for bioaccumulation or other relevant exposure scenarios that would apply to unconfined in-river disposal.

Regarding the geographic scope of EPA's cleanup levels, EPA's ROD provides where remedial action in the river has been selected. The final ROD requires cleanup from RM approximately 1.9 up to RM 12, based on current information but post-ROD baseline sampling may change the exact upstream or downstream area for cleanup. The cleanup levels will be applied to where remedial action will be taken. The ROD also provides that the downtown reach from approximately RM 12 to 16.6 is a source area that needs to be addressed through DEQ source control actions consistent with EPA's ROD so as not to recontaminate lower areas of the river. EPA's sediment cleanup levels for arsenic, hexachlorobenzene,

PCBs, cPAHs, 1,2,3,4,7,8-HxCDF, 1,2,3,7,8-PeCDD, 2,3,4,7,8-PeCDF, and 2,3,7,8-TCDD are based on sediment background concentrations derived consistent with EPA guidance based on sampling undertaken as part of the remedial investigation studies above RM 15.3 and thus are considered to be achievable. Other information in the administrative record supports that all other risk-based sediment cleanup levels are achievable as well.

EPA's ROD relies significantly on MNR in a majority of the Site to achieve the cleanup goals from cleaner sediment coming into the Site from upstream. Therefore, the USACE and the State of Oregon should consider potential impacts on the Portland Harbor Site in performing or authorizing dredge projects above RM 16.6 and particularly for considering unconfined aquatic disposal of dredged material exceeding EPA's cleanup levels. EPA's ROD also considers the benefits of the cleanup on further migration of contamination to the Columbia River. Furthermore, EPA is looking to the state to take a watershed approach in seeking to reduce toxics in the upper Willamette River so as to facilitate achievement of the ROD goals and benefit human health and the environment in the entire watershed. EPA is willing to coordinate with the USACE and state on upriver dredging projects.

Regarding the USACE comment that it would be NMFS' preference to allow Portland Harbor dredged sediment to either stay in the river or be disposed of in the Columbia. We note the USACE provided no supporting documentation of NMFS' views on the Portland Harbor cleanup and disposal issues. However, EPA is coordinating with NMFS and USFWS for compliance of the remedy with Endangered Species Act. EPA received comments from NMFS during the public comment period. EPA's understanding of NMFS's position is they feel that long-term improvements in sediment quality would represent a reduced risk to salmon. Further, EPA in its consultation process has met with the Yakama and other area tribes who have voiced concerns over contaminant loading to the Columbia River. The fact that the SEF does not address bioaccumulation of PCBs and other bioaccumulative toxins in fish tissue is a paramount concern of Tribes that have historically and currently fish in the Columbia and Willamette Rivers.

2.29.2 Prevent Conflict with City's Comprehensive Land Use Planning

Comment Summary

The City of Portland had the following comment regarding land use:

- "EPA must ensure that the Site-wide remedy and the remedial design for specific areas be consistent with the anticipated future land uses of Portland Harbor established by the City.

  Every Superfund remedy must be selected with consideration of future land use (CERCLA Land Use Directive, OSWER No. 9355.7-04, 1995 reaffirmed in the directive to Superfund National Policy Managers, OSWER 9355.7-06P in 2001). Oregon has unique land use laws that require development of enforceable land use plans and Portlanders are passionate about their involvement in planning the City's future land use.

  Portland recently adopted an updated comprehensive land use plan to guide development and investment in the City for the next 20 years, as well as a Climate Action Plan, and the City has enacted detailed zoning overlays that apply to Portland Harbor. These requirements and development standards define, protect and enhance the anticipated future uses in Portland Harbor, including industrial lands that support middle-wage incomes, habitat protection, critical flood control, and public access to recreation.

Much of Portland Harbor is designated as prime industrial land and thus the selected remedy and any associated technology assignments should not create physical or economic barriers to redevelopment on this economically valuable land. It is especially important that prime industrial land that is currently vacant be allowed to build docks or dredging moorages as needed to access the federal navigation channel. Portland's land use planning also provides specific community visions for how public access, riverine habitat and flood storage potential will be maintained and improved. Portlanders have worked hard to incorporate the right mix of uses in Portland Harbor. This includes extensive plans for greenways and human access trails in some areas of the Harbor.

Portland's land use planning process has created a clear vision of the anticipated land uses in Portland Harbor. In short, Portlanders anticipate that all land in Portland Harbor will be used to fill multiple community needs. The City requests that EPA engage City land use planners and the communities in and around Portland Harbor to ensure that anticipated future land uses in each area of the river are not impaired by the remedy, and that EPA provide flexibility in the ROD's application of cleanup technologies to be consistent with the detailed planning in place for current and anticipated land use."

EPA Response

EPA and the City of Portland, as a member of LWG, worked together on the remedial investigation and feasibility study and consideration of harbor use was incorporated into the development of PRGs (see 2.29.1). The primary goal of Superfund cleanup is to be protective of human health and the environment, and reasonably anticipated future uses plays an important role in cleanup decisions. EPA intends to be flexible in the implementation of the remedy, and those details will be developed in the remedial design and beyond. See also EPA's responses to comments in Sections 2.2.6, 2.21, 2.26, 2.35, and 2.37 of this responsiveness summary.

2.30 Miscellaneous Regulatory and Legal Issues

2.30.1 Be Consistent in Treatment of PRPs

Comment Summary

Two comments were received on the inconsistent treatment of PRPs.

- One commenter stated that the proposed plan does not provide the amount of information about sources of contamination as required by EPA guidance because the proposed plan does not fully describe the United States' involvement in WWII ship building and related activities that contributed to the contaminants found in the Portland Harbor. The commenter said that the ROD needs to clearly describe how these activities have significantly impacted the Site and that an important function of the proposed plan, comments on the proposed plan, and ROD is to serve as the basis for an allocation of liability among PRPs. It was stated that EPA has not identified all significant PRPs and identified the L.B. Foster Company, a former steel-pipe manufacturing facility at the WWII Assembly Building area. The commenter requested that EPA's issue a GNL and 104(e) Request to the L.B. Foster Company.

- A second commenter stated that parties with no or *de minimis* or *de micromis* contaminant contributions be removed from the PRP settlement process, and that to their knowledge EPA Region 10 has not yet implemented early settlement, *de minimis*, or *de micromis* settlement procedures.

EPA Response

As noted in the EPA guidance titled, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (Interim Final, October 1988)* (USEPA 1988), "[t]he remedial investigation and feasibility study process as outlined in this guidance represents the methodology that the Superfund program has established for characterizing the nature and extent of risks posed by uncontrolled hazardous waste sites and for evaluating potential remedial options." The results of the remedial investigation and feasibility study support the proposed plan (USEPA 2016c) and eventual the selected remedy. The remedial investigation, feasibility study, proposed plan, and the remedy decision document are not the vehicle for identifying potential responsible parties or allowing contributions. That is a separate function. EPA disagrees with the commenter's view more specific and extensive PRP information should have been in the proposed plan and should be in the ROD. Likewise, allocation of liability between PRPs is not a function of these two documents, but rather their primary function is to present the alternatives that were evaluated, communicate a proposed remedy for public participation and comment, and then to document the selection of the final remedy needed to protect human health and the environment.

The remedial investigation report (USEPA 2016a), Sections 3 and 4, contain significant information regarding the historical and current land uses in the Site and the sources from those uses that released contamination into the river. The major industries that operated along the river are summarized in Section 3.2 and includes discussion of World War I and II shipbuilding and dismantling of US Navy and U.S. Maritime Administration ships. EPA guidance does not discuss the level of detail about specific PRPs that the commenter asserts should be in the proposed plan and ROD. In fact, Section 6.3.2. of the ROD guidance provides that "specific PRP names need not be included" in the ROD. The list of PRPs identified as of the date of the proposed plan is in the administrative record [AR Doc #850002] which includes all federal agencies, departments or entities that have to date been identified as potentially liable for response costs.

The comments and information supplied by commenters regarding a company that may have operated on its property in the past and potential settlements with *de minimis* or *de micromis* parties are not related to the proposed remedy for the Site; therefore, will not be addressed in this responsiveness summary,

2.30.2 Explain Why Standard Procedures Appear to Be Misapplied

Comment Summary

Comments were received from NW Pipe Company, the Port of Portland, and Portland General Electric specific to misapplication of standard procedures. Those comments are:

- EPA has required that public access for fishing be provided at river bank areas that are on private property. The PRP should not have to provide the public access to their private slip. Or Site access or security limits risk.
- The International Terminals Slip was created through dredging upland areas and it does not share the same characteristics as the Willamette River. EPA has applied the same standards to the International Terminals Slip, an artificial creation, as it does the Willamette River, a natural feature.
- Alternative I was included in the feasibility study report after the draft version and has not been reviewed by NRRB and the Contaminated Sediments Technical Assistance Group.

EPA Response

Through its cleanup decision, EPA is not requiring landowners to provide fishing access or other public access to private property. The public has access to some portions of the Willamette River's banks and boats can access most portions of the river. Ecological receptors such as fish have access to all areas of the river, and may be exposed to COCs located in and near the International Terminals Slip. These fish then travel to other parts of the Willamette River where they can be caught and eaten by people and wildlife or birds. Therefore, sediments in the International Terminals Slip present can pose an unacceptable risk, regardless of whether or not people have access to the slip or not. See also Section 2.2.9 of this responsiveness summary.

Northwest Pipe Company has not provided a technical description of standards that are applied to the Willamette River that should not be applied to the International Terminals Slip. The characterization of the Willamette River in the remedial investigation report accounts for anthropogenic and natural activities. Under the proposed plan (USEPA 2016c), remedial action objectives are applied across the Site regardless of how particular areas were originally created.

2.30.3 Explain Why LWG's Feasibility Study Was Not Sufficient

Comment Summary

Union Pacific Railroad stated that EPA has delayed the process by revising LWG's 2012 draft feasibility study report (LWG 2012) which fulfilled the requirements of the law and EPA guidance. Union Pacific Railroad commented that the LWG feasibility study report proposed a workable, common sense cleanup that incorporated reliable science, and provided the required comparative analysis of alternatives based on realistic estimates of cost and time necessary to perform work.

EPA Response

See EPA's position to LWG Dispute Issue 2 (Appendix A of this document).

2.30.4 Consider that Flaws in the Proposed Plan Will Encourage Litigation

Comment Summary

Two commenters (Calbag Metals Co. and EVRAZ) commented on litigation concerns. They state that because the proposed plan is flawed (such as RAOs and associated PRGs are overreaching; components are technically and factually unsupported), a ROD based on the current proposed plan will likely result in litigation. This will result in long delays and increased costs to the PRPs due to litigation. EPA will then need to use its enforcement powers to compel performance of unilateral cleanup orders.

EPA Response

The purpose of the responsiveness summary is to respond to public comments on the remedial alternatives evaluated and supporting information and proposed plan (USEPA 2016c), not to address questions of liability or litigation in any detail. EPA anticipates that the parties responsible under CERCLA will pay for the cleanup and trusts that those parties will see the benefits of moving forward with the cleanup rather than litigation.

2.30.5 Respond Fully to Freedom of Information Act Requests

Comment Summary

One commenter (PCI Group) states that because EPA has not responded fully to their Freedom of Information Act request, EPA has not made the proposed plan's "supporting analysis information

available in the administrative record." Therefore, EPA has not provided the public a reasonable opportunity to comment on the proposed plan, which is required under the NCP.

EPA Response

The proposed plan (USEPA 2016c) and administrative record file contains the information that the agency considered. Any interested stakeholder has all the information needed to comment on the alternatives, including the preferred alternative, developed for remediating from approximately RM 12 to RM 2. Whether or not EPA had responded to Freedom of Information Act requests (which generally are not included in the administrative record) is not relevant to the completeness of the administrative record file. Neither the NCP, nor EPA's guidance, suggest any intersection between EPA's compiling of the administrative record file, and its response to Freedom of Information Act requests.

The administrative record file was delivered to the Multnomah County Central Library, the St. Johns Library and the Kenton Library with an additional copy also placed at the Historic Kenton Firehouse. Additionally, EPA's Portland Harbor Superfund webpage provides a web link to the full administrative record (https://semspub.epa.gov/src/collection/10/AR64506). Consistent with EPA's 2010 "*Revised Guidance on Compiling Administrative Records for CERCLA Response Actions,*" EPA has continued updating the administrative record file during the preparation of the responsiveness summary.

2.31 Support for Another Alternative

2.31.1 Consider Community Support for Alternatives B, E, G, G+, or H

Comment Summary

A total of 1,654 comments were classified as supporting another alternative. Almost all asked for Alternative G or higher, with only a few requests for Alternative B or E. Over 82 percent of the comments received were form emails that stated:

- "EPA should select Alternative G with additional dredging in areas of high human use, areas of high ecological value, and areas where there is high risk of recontamination of the river."
- "Recommend that EPA select Alternative "G," with modifications of additional dredged acreage recommended by the Audubon Society of Portland"
- "I support Willamette Riverkeeper's position that the Portland Harbor Superfund Site needs an aggressive clean up that protects people and wildlife for the long term."

The remaining comments were personal comments that included:

- "Alternatives G and H seem better than I. Alternative I is simply a Band-Aid approach and will achieve very little. It is understood that alternatives H and G will take longer and be more expensive or "less cost effective", as the report states but the result will come much closer to achieving the restoration goal. As stated earlier, this section of the river took industry a long time to degrade and much profit was made in doing so. It is only fair and equitable that some of this time and profit be returned to make this area right for the people of Portland and the Pacific Northwest."
- "Option I does not go far enough. Option G is the minimum level of clean-up necessary, with at least halfway between option G and option H being preferred. We are responsible to future generations to clean this river back to a pre-polluted state. Today's presenter spoke of a reasonable time frame as a consideration. It took 100 years for the river to accumulate this

contamination. The longest projection for cleanup (option H) suggests it could take over half that time (62 years) to remove it. While it may seem long, in context it is no unreasonable. Option G is projected to take 19 years, which would clean the river in less than a fifth of the time we've taken to pollute it. That is reasonable (far more reasonable than allowing it to remain in our river)."

- "Alternative E includes dredging about 40 more acres in SDU 6 Nav than the proposed Alternative I. I would prefer EPA's final plan should include this additional 40 acres of dredging. Removing this material would result in the Hazard Index for the area due to PAHs being lowered to 3, rather than at 5 in the proposed plan alternative I."
- "I am a midwife. The chemicals cause prematurity, low birth weight, birth defects, and learning disabilities. Save our children - Option G - Please."
- "Really. Lame-sauce dude! Do next to nothing? Bologna. Option G+ for the Willamette Superfund."
- "Please consider a speedier and more effective plan that could impact our local environment in a huge and positive direction. We as Portlanders need to set an example and practice our sustainable, green reputation and do something extraordinary for the fish, wildlife and our next generation. Thank you for reading and considering this important alternative and support Alternative G."
- "Please select Alternative G with additional dredging as proposed by the Portland Audubon Society. This is our chance to do it right. The Willamette River has been ruthlessly used/abused by a long list of polluters including ExxonMobil, Northwest Natural and the Port of Portland. A partial clean-up is not adequate and does not serve the citizens adequately. We want our river back. It is vital to the health of our communities, our environment and our wildlife. This can only be accomplished by selecting Alternative G with additional dredging as proposed by the Portland Audubon Society."
- "In sum, the Oregon Chapter of the Sierra Club believes that Alternative G offers the best and most effective remediation of the Portland Harbor Superfund Site, short of complete removal of all contaminated sediment. We therefore recommend the adoption of Alternative G with enhancements to further protect health and the environment and ensure the long-term effectiveness of the cleanup."
- "According to the Plan, EPA found that all remedial alternatives except Alternative A would be protective of human health (Plan, p. 50.), but rejected Alternative B as too slowly protective of the environment (Plan, pp. 50 – 51). But because "none of the alternatives address all ecological risks" (Plan p. 60), the advantages of Alternative B, as the fastest and cheapest alternative with the least in-river construction, may exceed its disadvantages."

EPA Response

EPA shares commenters' concerns about providing for a remedy that addresses risks to the health and well-being of everyone who lives near or uses the Willamette River as well as protection of fish, wildlife, and other organisms in the waterway in a timely manner. EPA has sought in its selected remedy (Alternative F Modified) to provide the best balance of achieving the most reduction in risk to people and aquatic organisms through a protective cleanup while reducing short-term impacts to the environment, the community, and workers during and after construction.

Many of the commenters stated a concern that the preferred alternative in the proposed plan (USEPA 2016c) did not involve enough dredging—that more dredging should be selected instead to reduce time to achieve cleanup goals and allow fish consumption advisories to be lifted sooner. Many commenters asked that EPA select at least Alternative G, Alternative G+, or Alternative H. Due to the vast majority of commenters' concern that the proposed plan left too much contamination for MNR as well as other issues raised with the proposed plan alternative, EPA has selected Alternative F Modified which will actively address an additional 103 acres of contaminated sediment. Therefore, selected remedy will remove up to 3 million cubic yards compared to approximately 1.75 million cubic yards of sediment than Alternative I. The selected remedy calls for the highest levels of contamination to be removed through dredging (roughly 3 million cubic yards) or to be isolated through capping (176 acres). ENR and MNR are employed only in areas with lower levels of contamination. EPA's analysis of alternatives shows that any larger, removal-based remedy beyond Alternative F Modified, such as Alternative G, would not substantially improve public health and environmental protection but would take a good deal longer, cost substantially more, have greater short-term impacts to aquatic organisms in the waterway and to the community surrounding the waterway because of dredging activity, and require the processing, transporting, and landfilling of millions of additional cubic yards of sediment with low levels of contamination.

In addition, Alternative G would impact the surrounding communities with substantially more traffic on the waterways, rails, and roads than the selected remedy. The potential for accidents, spills, and aquatic habitat disturbances from dredging and transporting such large volumes of contaminated sediment would be much greater for Alternative G than for the selected remedy.

It is important to note that an Alternative G+ was not identified nor evaluated in the feasibility study, so EPA cannot specifically comment on the merits of that alternative. However, EPA did evaluate a more aggressive dredging alternative than Alternative G (Alternative H), and the overall conclusions of the evaluation are similar to those for Alternative G but with even longer construction timeframes, larger negative short-term impacts including habitat losses during construction, and higher costs for the incremental additional risk reduction achieved. Alternative H would cost approximately 5 times more than Alternative G and would take 62 years to complete (compared to 19 years for Alternative G), with associated impacts to the community and potential releases to the environment for that period of time.

Dredging plays a significant role in the selected remedy but so do capping, MNR and ENR, based upon engineering considerations of site conditions (such as potential for erosion, sedimentation from upstream, and observed trends in natural recovery). The selected remedy in this ROD calls for the highest levels of contamination to be removed for upland disposal through dredging or to be isolated through robust capping that include components for in-place treatment. ENR and MNR are employed in areas with lower levels of contamination and conditions favorable for natural recovery to be effective at reducing contaminant levels and risk in a reasonable timeframe. Remaining risks to human health will be managed through ICs until cleanup levels and RAOs are achieved.

In response to the comment that said: "But because "none of the alternatives address all ecological risks" (Plan p. 60), the advantages of Alternative B, as the fastest and cheapest alternative with the least in-water construction, may exceed its disadvantages." EPA wants to point out that immediately after construction of the selected remedy, it is estimated that wildlife will be able to safely consume prey from within the Site since all non-cancer risks on a Site-wide scale will be addressed. It is estimated that BEHP will be at a HQ of 5 at a river mile scale and 3 at an SDU scale, very close to the target of 1 and well within potential calculation variances. For RAO 5, the interim target was 50 percent of the benthic risk

area. Thus, Alternatives D through G, including I and F Modified achieve the RAO 5 goal. For RAO 6, only Alternatives F, F Modified and G achieve the interim target.

2.31.2 Evaluate a Different Alternative for Swan Island

Comment Summary

Twenty-one comments were received as part of a form email stating:

- "Sediment should be removed from the Swan Island area rather than implementing a massive input of carbon."

Two additional comments also addressed sediment removal at Swan Island:

- "Re: Swan Island Lagoon (p 60): Similar to comment #7 above, I would urge that EPA's final plan include disrupting more benthic area and remove more than 50 percent of the risk from PCBs and Bphthalate."
- "Recommendation for an Optimized Remedial Approach**.** In summary, the optimized remedy would provide for:
    - Dredging of sediments in the FMD to allow implementation of additional remedial technologies;
    - ENR with amendments as well as armoring to protect against propeller wash in the berth areas;
    - Assuming that future site investigation demonstrates no adverse propeller wash impacts and thus ENR permanence, ENR with amendments (GAC, for example) in the lagoon areas away from the berths;
    - Dredging of sediment in dry dock areas to adequate depth and placement of a residual layer where PCB concentrations in the leave surface exceed the RAL;
    - ENR with amendments in lagoon areas outside the FMD zone where PCB concentrations at the sediment surface exceed the RAL; and
    - Either MNR or ENR in areas outside the PCB RAL footprint, depending on the results of sampling and other studies performed during remedial design."

EPA Response

In response to the comments seeking more dredging in Swan Island Lagoon, the selected remedy was chosen in order to provide a balance between minimizing the time required for remediation and implementing a suitably protective cleanup to minimize the risk to public health and the environment in the future, in an area where ENR is very likely to be highly effective. EPA has selected Alternative F Modified which will address an additional 37.7 acres of contaminated sediment in Swan Island Lagoon than Alternative I would have. After the remedy has been implemented, EPA will use sampling and monitoring results to guide and refine the cleanup action selected to provide additional assurance that the process is reducing contaminant concentrations and bioavailability as expected.

In response to the optimized remedial approach provided by a commenter, the selected remedy was chosen to provide a balanced approach in achieving remedial cleanup levels. The ROD includes a flexible decision tree which will dictate the design and remedial construction and is intended to provide a clear direction on what action should be taken under different conditions and locations.

2.32 Proposed Plan Content

2.32.1 Provide Capital Costs that Are Lacking in the Proposed Plan

Comment Summary

One commenter had specific concerns about the presentation of capital and periodic costs in the proposed plan, writing

- "Capital costs and periodic costs have not supporting documentation indicating how these costs were derived. No engineering duration or costs appear to be included in any of the alternatives. Construction durations have no supporting documentation indicating how those durations were established. Pg. 66 of the Plan states, "The technologies of dredging, capping, ENR and MNR have been demonstrated to be technically and administratively feasible at various other Superfund sites." But the Plan provides no information about clean-up of other Superfund sites. Surely there have been other Superfund sites where at least some of the technologies EPA proposes have been used that would provide real historical data on the actual cost, duration, and effectiveness of these technologies to eliminate and/or contain contaminants is similar waterways. Without such supporting documentation, there is no substance to the data promoted in the alternatives EPA discusses. Please provide all case studies info. Without this data, the public has no way of providing intelligent feedback on this Plan."

EPA Response

EPA has documented the methodology and assumptions used in developing various unit costs in Appendix G of the feasibility study report (USEPA 2016b). These unit costs were used to estimate capital costs and periodic costs in the detailed analysis cost estimates. The cost estimate backup as presented in Appendix G also includes Cost Source Database; EPA Derived Labor Costs; Project-Specific Vendor Quotes; Previously Developed Costs by Anchor QEA; EPA Derived MII Costs; and Costs from Other Projects/Sources. Also, Attachment A of Appendix G, presents further information about the development of the cost estimate.

During the feasibility study, a cursory evaluation of construction duration was performed for the major construction components (capping and dredging) as indicated in Appendix D.3 of the feasibility study report. A detailed construction schedule is generally not produced because the level of scope definition is too low to make those design-level determinations. It should be noted that schedules indicate a minimum duration and that longer durations only affect present value cost as estimated. The productivity rates presented in a memo from USACE (Palermo 2008) was used to calculate construction durations.

Where appropriate, information from other sediment cleanups or dredging sources were considered and used to prepare the feasibility study and in particular the cost estimates; however, cost estimates need to be site-specific and related to the remedial alternatives being compared for the particular circumstances at a site.

2.32.2 Address McCormick and Baxter Superfund Site Issues

Comment Summary

Two commenters feel that cleanup work has not been adequately completed at the McCormick & Baxter Superfund Site and that additional cleanup work should be conducted as part of the Portland Harbor Superfund Site. The commenters wrote:

- "The McCormick & Baxter plant site has been frozen for several years. The current EPA process for that plant isolates it from the overall Portland Harbor process, but the site is listed in the plan. This separation only ensures that nothing more will be done but the plant site will continue to weep contaminants into the Willamette River. EPA should bring the site back into the Harbor process and as of 2016 reconsider the option of cleaning up the site, for potential reuse as riverside industrial property. The success of the Washington Department of Ecology and the Port of Ridgefield in "cleaning up" the Pacific Wood Treating provides a change in facts that deserves an EPA review and reconsideration, to protect the Willamette River and potentially reduce or remove the continuing expense of isolating the site."
- "McCormick and Baxter Superfund Site. Even though this site has been somewhat completed; parts of it needs attention because it is still part of the Superfund site river bank."

EPA Response

The McCormick and Baxter Superfund Site is a former creosote wood treating facility that was listed on the National Priorities List (NPL) in 1994 where cleanup under a CERCLA ROD was completed in 2005 and is currently undergoing statutory five-year reviews to ensure the remedy remains protective. The Site consists of three OUs; OU1, OU2, and OU3 address the soil, sediment, and groundwater remedies, respectively. Cleanup included demolition of the McCormick & Baxter plant, excavation and treatment of contaminated soils, soil capping, sediment capping and construction of a subsurface barrier wall. While the McCormick and Baxter Site is located within the Portland Harbor Superfund Site, it is not included in the selected remedy for Portland Harbor because the sediment OU of the McCormick and Baxter Site remedy is completed, and monitoring indicates it is protective of human health and the environment.

The McCormick and Baxter Site will be monitored in perpetuity to ensure that it remains protective of human health and the environment. The most recent five-year review for McCormick & Baxter was completed in September 2016 (USEPA 2016e) which included close inspection and passive sampling of the in water sediment cap and determined that the soil remedy, sediment remedy, groundwater remedy, and engineering and ICs are functioning as intended by the 1996 ROD, as modified by the 1998 Amended ROD and the 2002 Explanation of Significant Difference. The five-year review further states there have been no changes in the physical conditions of McCormick & Baxter that would affect the protectiveness of the remedy. However, EPA determined that the groundwater cleanup levels as calculated for the McCormick and Baxter Site are not appropriate as substitutes for MCLs in groundwater. Therefore, the September 2016 five-year review determined that, in order for the remedy to be protective in the long term, the following actions need to be taken: formally replace the ACLs with revised cleanup goals and identify the associated points of compliance for the groundwater remedy in a ROD Amendment or ESD, and implement ICs required by the ROD for the groundwater remedy. EPA expects that those actions will be taken within the next five years. The next five-year review is required to be completed in September 2021.

2.32.3 Explain the Depiction of Groundwater Plumes in Proposed Plan

Comment Summary

A total of nine comments were received about issues with how groundwater was described in the proposed plan. Commenters had questions about Figure 5, specifically on how or why that figure was developed. They believed that the plumes on the figure were drawn much larger then they have previously been described at the Site, drawn to extend into the Willamette River, and/or are "cartoonish" in nature. Additionally, a three commenters noted that the COCs which compose the groundwater plumes are not described in the proposed plan.

EPA Response

Proposed plan Figure 5 (USEPA 2016c) is a modification of Figure 4.3 *Identified Groundwater Plumes January 2016* of the Portland Harbor Upland Source Control Summary Report (DEQ 2016). The groundwater plumes and associated COCs were identified by DEQ through their upland source control evaluations. Figure 5 presents a feasibility study level of understanding of the extent of COCs in groundwater potentially discharging to the Willamette River and was used to facilitate evaluation of remedial alternatives. The proposed plan did not describe in detail the nature and extent of contamination in each groundwater plume nor did it describe the source control measures implemented at each facility or site-specific pathways to the Willamette River. Such detail is available in facility-specific conceptual site models, which were developed under DEQ's Upland Source Control Program. Groundwater plumes in each SMA will be further characterized during remedial design such that caps are appropriately amended as needed to meet cleanup levels.

2.32.4 Address the Groundwater Transport Mechanism

Comment Summary

Regarding groundwater transport, one commenter wrote:

- "The plan failed to mention the groundwater colloidal transport mechanism. This transport method is described as sorption of the dioxin/furans compounds onto organic carbon suspended in the groundwater. Carbon particles less than 0.7 microns in size are known to travel freely in aquifer matrices and the sorption of the dioxins/furans onto these particles may facilitate transport in groundwater. The groundwater flow characteristics need to be understood to predict when the contaminants will impact the river and those may occur over a longer time period than is normally associated with contaminant transport in groundwater. For this reason, Total Organic Carbon (TOC) analysis should be added to the groundwater monitoring program and aquifer characteristics such as gradient and transmissivity should be modelled to obtain estimates of dioxins/furans impacts to the river by this transport mechanism. Long-term monitoring programs may be needed to assess the significance of this transport mechanism in groundwater and to the river."

EPA Response

Groundwater investigations are being conducted under oversight by the DEQ and vary from location to location. As a result, the exact parameters of any groundwater monitoring program are determined by DEQ based on site-specific conditions. However, groundwater investigations typically include estimates of hydraulic gradient and transmissivity. EPA will be working with DEQ do develop groundwater monitoring program requirements to ensure harbor-wide data needs and cleanup levels are being met. Additional information regarding the groundwater plumes is provided in Section 2.32.3 of this responsiveness summary.

2.32.5 Provide Information Lacking on Dioxin/Furan Data

Comment Summary

One commenter had specific concerns on dioxin and furan data provided in the proposed plan, writing:

- "Dioxins and furans are shown as contaminants of concern however the presentation of the data has not been adequately presented. The toxicity equivalence quotients data presented are high level summaries of the individual dioxins/furans compounds and adequate explanations as to how the data were compiled was not presented."
- "The dioxins and furans analytical method information was not adequately presented (it should be added to the footnotes of the tables). Since there is a high resolution and a low resolution method associated with the dioxins/furans analysis, this can potentially cause misinterpretations of the data. For example, a non-detection "ND" using the low resolution method may be significantly elevated compared to a ND for the high resolution method. This topic does not appear to have been mentioned and it can cause significant misinterpretations of the data (e.g. for example possibly 200-fold difference). Add notes to explain the methods associated with the analytical methods. ND's by the low resolution method should be qualified and not haphazardly combined using the toxicity equivalence quotient method with results from the high resolution method."
- "Where the study relies on the low resolution mass spectroscopy method, the data set should be supplemented with additional collection of samples and testing with the high resolution method to confirm the results (in situations where NDs occurred, they should be verified by the high resolution method)."

EPA Response

Dioxin and furan data are presented in the remedial investigation (*RI_BERA20110727+RA-SummedParams.mdb*) and feasibility study (*LWGFSdbwEECA_GASCOandArkema.accdb*) databases for the Site and is available as part of the administrative record. These databases include results for individual dioxin and furan congeners as well as dioxin homologs and dioxin as 2,3,7,8-TCDD toxicity equivalent quotients. As the commenter notes, both high and low resolution methods were used for certain analyses such as PCB Arcolor and PCB congener analysis. Early in the remedial investigation, detailed criteria for selection of values from multiple results for the same chemical in a sample were developed. Also, approximately 30 percent of the low resolution total PCB Aroclor analyses were supplemented by high resolution congener analysis. In addition to these measures, EPA developed the Round 2 Quality Assurance Project Plan in June 2004 (Integral and Windward 2004) and subsequent addendums to ensure data quality adequate for remedial investigation, feasibility study, proposed plan (USEPA 2016c) and the ROD. As a result, these data are considered adequate for remedial decision making. In addition, more detailed data will be collected for the remedial design phase.

2.32.6 Explain Why Mercury is Not Included in the Description of Risk Reduction

Comment Summary

A comment was received that stated "EPA must correct the understanding regarding fish advisories and revise the proposed plan to expressly reference the impact of mercury and other relevant watershed-wide contaminants and present a more complete and frank assessment as to the actual likelihood of advisories being lifted for each remedial alternative. Only then will the public be able to provide more meaningful comments on these issues and evaluate the actual costs and benefits of each alternative."

EPA Response

The topic of mercury contamination (site-wide and beyond) has been discussed previously with the public at multiple working groups and public meetings. EPA's remedy is addressing releases of hazardous substances from facilities associated with the Portland Harbor Site and the alternatives evaluated and proposed plan (USEPA 2016c) is focused on that goal. As discussed in Section 2.3.2 of this document, fish consumption advisories will be less restrictive once the cleanup has been completed. However, EPA agrees that fish consumption advisories likely will not be lifted completely due to larger watershed issues (such as mercury) and also because concentrations of PCBs in "clean" areas upstream of Portland Harbor are higher than the acceptable range based on conservative risk estimates, and sediments naturally move downstream.

Over time, it is expected that source control actions on the part of DEQ in Portland Harbor and watershed-wide (including upstream areas) will reduce or eliminate the need for fish consumption advisories. In addition, as part of the selected remedy EPA will implement a communication outreach program to inform the public throughout the remediation regarding levels of contamination in fish/shellfish and how much fish is safe to eat.

2.32.7 Explain Why PTW Figures Are Different

Comment Summary

The footprints of PTW – Not Reliably Contained in the feasibility study report, Figure 3.2-5 and the proposed plan, Figure 7, are different.

EPA Response

EPA inadvertently used the wrong data set to map the PTW-NRC (naphthalene) footprint along the offshore of NW Natural to create Figure 7 of the proposed plan (USEPA 2016c). This figure has been updated to correct the PTW-NRC footprint (as presented in Figure 3.2-5 of the 2016 feasibility study report (USEPA 2016b)) in the ROD.

2.32.8 Provide Studies of Technology Use at Other Superfund Sites

Comment Summary

One person commented that "Pg. 66 of the Plan states, 'The technologies of dredging, capping, ENR and MNR have been demonstrated to be technically and administratively feasible at various other Superfund sites." But the Plan provides no information about clean-up of other Superfund sites. Surely there have been other Superfund sites where at least some of the technologies EPA proposes have been used that would provide real historical data on the actual cost, duration, and effectiveness of these technologies to eliminate and/or contain contaminants is similar waterways. Without such supporting documentation, there is no substance to the data promoted in the alternatives EPA discusses. Please provide all case studies info. Without this data, the public has no way of providing intelligent feedback on this Plan.'"

EPA Response

Proposed plans are summary documents designed to be easily readable by the public. As such, the level of detail required the proposed plan for the Site (USEPA 2016c) does not support the inclusion of case studies on specific technologies. The feasibility study alternative screening and evaluation process used those data extensively in the alternative development and evaluation process. The feasibility study report (USEPA 2016b) includes where appropriate information on similar sites was used in discussion of applicable technologies.

2.33 Human Health Risk

2.33.1 Evaluate Existing Exposure From PCBs in Air

Comment Summary

A total of 41 comments were received on this topic, with roughly 36 percent received as form emails that stated:

- "Include atmospheric transport in analysis of exposures. This inclusion will indicate the extent to which remaining contamination will expose humans in the community to unacceptable risks."

The remaining comments were similar in content and most people seemed to be concerned primarily about the risk from volatilization of PCBs under existing conditions. Several people stated that PCB volatilization had not been included in any part of the EPA analysis or proposed plan and that recent studies existed showing that PCBs in sediments could volatilize and result in unacceptable releases to the atmosphere without the added disturbance of construction.

Representative comments include:

- "Air volatilization of PCBs needs to be a consideration for removal of a larger volume of sediment. Dr. David Carpenter's studies have shown that residents living within 5 miles of a water Superfund site are adversely effected by PCB exposure."
- "New information about volatilization of PCBs needs to be included. The latest information about volatilization of PCBs needs to be examined as a pathway of contamination to humans and the environment as part of the process to evaluate both human health and ecological risk."
- "Dr. Peter deFur recently reviewed the proposed plan and stated that, quote, "Atmospheric release of PCBs is not included in any part of the EPA analysis or the proposed plan. Recent research confirms that PCBs can be released into the air, that air can be a source of human exposure, and that exposure by inhalation can cause harmful health effects in people."
- "EPA fails to analyze the potential of atmospheric transport of PCBs as a potential exposure pathway in either the clean-up plan or the feasibility study. This is a significant omission in EPA's analysis. The CAG's comments provide an extensive discussion of the scientific literature supporting the need to analyze this risk. We urge EPA to include a robust analysis of the risk vaporization of PCBs and address it as appropriate in the final plan and ROD."
- "PCBs are of particular concern because of air disposition, with people living within 5 miles of a PCB contaminated body of water showing elevated levels of PCBs in their bodies. (see Carpenter/New Bedford, MA)"
- "You have ignored volatilization of PCBs - Cadument had a school and a neighborhood who were made very ill due to PCB air volatilization blowing over them. We do not want this, please monitor appropriately."
- "The City has heard concerns from the public related to the potential for air toxics from the release into the air of contaminants found in the sediment. Due to community concerns, please address the potential for volatilization of PCBs from sediment."

- "In 1976, the Toxic Substance Control Act gives you, the EPA, authority to restrict PCBs from our environment. The current plan does not provide an adequate level of protection from the known health risks to our citizens from PCBs. Literature provides abundant documentation of the health-related problems from PCBs. Infants are exposed to PCBs through breast milk, and even before birth through transplacental transfer. As far back as 1996, The New England Journal of Medicine reported intellectual impairment of children exposed to PCBs, with lower cognitive ability, immune compromise, and motor control problems. In 2013, the International Agency for Research on Cancer reported evidence supporting cancer-causing effects from PCBs. Adults can suffer from severe hormonal disruption which affects metabolism and reduced immunity."
- "In a study I just learned of Scientists Linking Autism to PCBs and Other Chemicals it was determined that two compounds in -- PCB 138/158 and PCB 153 -- stood out as being significantly linked with autism risk when their mothers are exposed during the second trimester of pregnancy. As we've learned, PCBs become air born and therefore have a huge risk potential for people living near the River. I and some other volunteers are hoping to petition the CDC for a human health study for these kinds of risks related to the superfund."

Comments received related to implementing the cleanup safely during construction (through monitoring and use of best management practices) are addressed in Section 2.29 of this responsiveness summary.

EPA Response

The baseline human health and ecological risk assessments for the Site identified exposure pathways to be evaluated quantitatively. As described in Section 3.3 of the human health risk assessment (Kennedy/Jenks Consultants. 2013), exposure pathways were characterized as potentially complete, potentially complete but insignificant, incomplete or potentially complete but evaluated for a different receptor. Consistent with EPA risk assessment guidance, inhalation of contaminants released from sediment was not identified as a complete exposure pathway to be quantitatively evaluated in the human health risk assessment. Specifically, PCBs are not expected to volatilize significantly from sediment due to their low vapor pressure. Human health risk assessments conducted on the Hudson River in New York, where PCB concentrations are much higher than they are in Portland Harbor, concluded that the calculated cancer risk from the inhalation of volatilized PCBs was insignificant (TAMS and Gradient 2000). Inhalation of volatile organic compounds released from surface water was considered a potentially complete but insignificant exposure pathway for all receptors.

The highest surface concentrations at the Site are in the 1 to 35 parts per million range, most of which are to be removed by dredging or sequestered by capping leaving no possibility of long-term emissions to air. Due to their hydrophobic tendency, the highest fraction of PCBs in the system will exist within the sediment and less so within the water and air. Fundamentally, it is this property that causes these COCs to accumulate in river sediments and also makes them unlikely to volatilize into the atmosphere. Continuous release of PCBs to the air is not expected and has not been documented at other similar sediment sites.

Due to the conclusions of the Hudson River study and the relatively low concentrations of PCBs in Portland Harbor, exposure due to inhalation of PCBs is not expected to result in substantial risk. Fish consumption remains the main exposure pathway for PCBs. In order for PCBs to evaporate in high enough levels to present a risk to human health or the environment, highly contaminated sediments would need to be exposed to the air for long durations. No such condition exists or will exist at the Site.

During the design process, EPA will review any relevant new information regarding PCB volatilization to determine if credible new data exist to indicate that there is an existing human health risk from volatilization of PCBs sufficient to revisit the remediation footprint. The CERCLA process also provides safeguards to ensure that remedies remain protective at sites where waste is left in place, in the form of five-year reviews once construction begins. Those reviews can include assessment of significant new data regarding protectiveness of the remedy.

In response to the comments on human health risks of PCBs, particularly risks to infants from breastmilk, EPA acknowledges the noted studies on such health effects and evaluated risks to infants whose mothers ate resident fish from Portland Harbor in the BHRRA. The BHHRA determined that exposure to bioaccumulative contaminants (PCBs, dioxins/furans, and organochlorine pesticides, primarily DDx compounds) via consumption of resident fish poses the greatest potential for human exposure to in-water contamination. The greatest non-cancer hazard estimates are associated with bioaccumulation of PCBs through the food chain and exposure to infants via breastfeeding. Due to those conclusions, EPA has determined that cleanup of PCBs and other bioaccumulative toxics found at the Site require cleanup.

2.33.2 Include Transient Species in Risk Evaluation

Comment Summary

Two comments were received related to fish consumption. They cite underestimated risks due to a lack of inclusion of transient fish (such as salmon) and Fish Consumption Rates recently passed in Oregon and Washington.

The comments are:

- "Risk estimates for fish consumption do not include additional risk from consumption of transient fish, such as salmon, that could be a large proportion of the subsistence diet. This makes the risk estimate an underestimate of the true risk, as opposed to the statement by EPA and/or the Lower Willamette Group that the estimates of risk are upper bound estimates."
- "EPA must also recognize the import of the new Fish Consumption Rates that have been passed in Oregon and Washington's water quality rules -- which are the nation's highest. This is a reflection of the needs of our fishing peoples, and a recognition that a century of industrial pollution has created serious harm in their communities which we must commit to removing. EPA's Portland Harbor clean-up MUST move with all deliberate speed toward the protection of marine life and fish-dependent communities who are at risk from the accumulation of toxic substances in species like the pacific lamprey -- both from immediate absorption, and from risks to the marine food chain if lamprey continue on their current path to extinction."

EPA Response

EPA's remedy focuses on reducing the risks to consumers of resident fish. This is because the remedial investigation determined that resident fish such as smallmouth bass and carp contain higher levels of contamination than transient fish such as lamprey, salmon and sturgeon. In addition, due to the large home range of transient fish, it is not possible to quantify the contribution of contamination in Portland Harbor versus other sources. However, because EPA's remedy is designed to reduce tissue concentrations of resident fish to protective levels, the potential for exposure to transient fish will also be reduced.

Regarding fish consumption rates, EPA's risk assessment used a range of exposure scenarios including a non-tribal subsistence fisher at a fish consumption rate of 142 grams per day consuming only resident fish only, and a tribal fish consumption rate of 175 grams per day consuming a mixed resident and transient fish diet. In addition, ambient water quality standards established by the State of Oregon that are based on a fish consumption rate of 175 grams per day are considered applicable or relevant and ARARs for the Site. Under CERCLA, the remedy is required to meet ARARs such as the state water quality standards.

EPA's tribal fish consumption scenario is based on a mixed diet that includes both resident and transient fish which was done at the request of the tribes and consistent with the Columbia River Inter-Tribal Fish Commission study on tribal fish consumption. Thus the risks associated with consumption of transient fish is considered in the tribal risk assessment and does not result in an under estimation of risk. Additional information on transient fish species is provided in the discussion of tribal comments in Section 3 of this responsiveness summary.

2.34 Ecological Risk

2.34.1 Address Inconsistencies in Benthic Risk

Comment Summary

Several comments were received from LWG and other businesses questioning the benthic risk evaluation presented in the 2016 feasibility study report and proposed plan. The commenters noted that the identification of benthic risk areas in the feasibility study report was inconsistent with the EPA approved BERA (Windward 2013) which relied on a multiple lines of evidence evaluation of benthic risk using the comprehensive benthic risk area approach.

The comments are summarized as follows:

- Several commenters stated that there is no scientific basis for EPA's abandonment of the comprehensive benthic risk area and that the new approach in the feasibility study is not more accurate, not more consistent with the BERA, and not more predictive of benthic risk or the effectiveness of the alternatives. Commenters further stated that EPA's 2016 analysis for analyzing benthic risk is a significant and technically indefensible departure from the well vetted comprehensive benthic risk area. They state that EPA abruptly and without explanation abandoned the approach and EPA's preferred alternative now identifies areas for cleanup based on a single point exceedance of a PRG.

- One commenter stated that EPA supported the comprehensive benthic risk area approach for many years before abruptly abandoning it in the final stages of preparation of the 2015 draft feasibility study report. The commenter stated that on April 4, 2014, EPA provided final direction to LWG on mapping the comprehensive benthic risk areas for the 2012 LWG draft feasibility study and on February 27, 2015, EPA requested that LWG submit revised text and maps incorporating its April 4, 2014 direction.

- Commenters noted that EPA simply mapped benthic PRG exceedances and used a 10 times exceedance factor to identify benthic risk areas, then arbitrarily determined that if active remediation addressed 50 percent of the benthic risk area, protectiveness would be achieved. Several commenters stated that the interim targets are arbitrary and that determination that a remedy is protective if it achieves 50 percent of the interim target is a second arbitrary step not tied to any quantitative assessment.

- Many commenters stated that EPA's assessment of benthic risk is arbitrary and capricious because it is not based on available toxicity testing data in sediments, and no credible scientific basis supports EPA's delineation of benthic risk areas and the extent of remediation necessary to reduce risks in these areas. If there is not risk to benthic organisms based on actual toxicity data, there is no need for remediation in those areas.
- It was noted that the large benthic risk areas mapped in the 2016 feasibility study report and proposed plan extend into areas shown to lack toxicity based on laboratory toxicity tests and other BERA lines of evidence. Thus, the benthic toxicity that EPA's proposed plan assumes exists in these area in fact does not exist and that the overall result of this haphazard approach is to require large amounts of active remediation on the basis of RAO 5 while failing to even address all of EPA/LWG comprehensive benthic risk areas previously agreed to.
- Commenters stated that the comprehensive benthic risk area approach identified approximately 61 acres for remediation based on benthic risk. It was noted that the benthic risk areas identified in the feasibility study report represented 1,289 acres or approximately 20 times the comprehensive benthic risk area. It was further noted that despite this, EPA's preferred alternative fails to capture 16 percent of the locations mapped through the EPA/LWG approach as presenting clear evidence of benthic toxicity.
- Several commenters suggested that the ROD should allow for modification of remedial footprints established based on benthic toxicity during remedial design and that EPA's ROD should state clearly that parties may use site-specific toxicity testing to verify model outcomes and design the final remedial action. It was suggested that relevant information, including data collected in pre-remedial design or remedial design work led by actual benthic toxicity testing, should be evaluated consistent with the EPA-approved BERA and refine benthic risk areas for active remediation, not by using single point exceedances.
- One commenter noted that the evaluation of PAHs at Terminal 4 should be based on direct toxicity measurements rather than EPA's 2016 benthic risk analysis because PAH contamination associated with pencil pitch present in Terminal 4 sediments is less bioavailable than other forms of PAH contamination.
- It was noted that the benthic risk evaluation utilized in the 2016 feasibility study and proposed plan is flawed and inconsistent with the BERA. As a result, RAO 5 PRGs are not risk-based and therefore are inconsistent with NCP and application of the PRGs leads to arbitrary and capricious remedial determinations.
- Another commenter stated that EPA failed to account for the fact that site benthic risk has improved since the data used in the BERA were obtained and that the Alternative B RALs as specified in the proposed plan would result in acceptable benthic risk reduction for the entire Site.
- Two commenters stated that EPA makes numerous errors, or did not properly document individual benthic PRGs for RAO 5 for a number of chemicals including PCBs, TPH, DDx, DDE, DDT and cadmium.

EPA Response

The commenters do not provide a clear or specific basis for why the comprehensive benthic risk area approach should be used instead of the BERA (Windward 2013) and the 2016 feasibility study report (USEPA 2016b) alternatives evaluation approach. To clarify, the comprehensive benthic risk area approach was not utilized in the final BERA presented as Attachment G of the remedial investigation report (USEPA 2016a). Rather, benthic risks were evaluated using multiple lines of evidence as presented in Section 6 of the BERA report (Windward 2013). The evaluation of benthic risk in the BERA considered multiple lines of evidence including sediment toxicity testing, the floating percentile and logistic regression predictive models, generic sediment quality guidelines, tissue residue assessment and comparison of surface water and transition zone water to water based toxicity reference values.

In the BERA, impairments in survival and growth (expressed as biomass) were directly measured at nearly 300 locations, using site-specific sediment toxicity tests with two benthic invertebrate species. The co-occurring sediment contaminant concentrations where toxicity was observed were used in the development of two site-specific predictive models of sediment toxicity, the floating percentile model and the logistic regression model. Contaminant concentrations predicted to be toxic from these two models were used to evaluate benthic risk on a point-by-point basis in the final BERA. The two models are also the source of many of the RAO 5 sediment PRGs (and the resulting cleanup levels in the ROD) for ecological risk. Other PRGs are based on generic sediment quality guidelines and tissue residue line of evidence. Overall, the PRGs for RAO 5 were based on the sediment quality values derived in the BERA and incorporate the empirical toxicity results conducted at the Site. Thus, the PRGs (and the resulting cleanup levels in the ROD) are consistent with the conclusion of the BERA.

The comprehensive benthic risk area developed by EPA is shown in Figure 4.1-1 of the 2016 feasibility study and was developed using interpolation of surface sediment concentrations exceeding the RAO 5 PRGs. Mapping of benthic risk areas based on a point-by-point PRG exceedance is justified due to the limited mobility of many of the benthic species (for example, oligochaete worms and the Asiatic clam, *Corbicula fluminea*) that comprise the benthic community at the Site. This means that some benthic species may be exposed to contaminant concentrations exceeding risk-based thresholds for the majority of their lifetime. Additionally, benthic species are likely exposed to sediment contaminant concentrations for a sufficiently long exposure duration that results in contaminant bioaccumulation to concentrations (the RAO 6 PRGs) posing risks to aquatic-dependent wildlife species that prey on benthic species. Since EPA's RALs for requiring active remediation are not based on benthic risk PRGs, they will be monitored post construction until such time as they are achieved.

Under EPA's *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments – Interim Final (June 1997)* (USEPA 1997) adverse effects on populations can be inferred from measures related to impaired survival, reproduction and/or growth. A subsequent EPA Policy memorandum (*Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites, OSWER Directive 9285.7-28 P, October 7, 1999*) (USEPA 1999) states that ecological risk assessments are intended to protect local populations and communities of biota. This approach was extensively used to evaluate ecological risks at Portland Harbor. The conclusions of the BERA indicate which contaminants are posing unacceptable risk based on those lines-of-evidence (site-specific toxicity tests, bioaccumulation models, and species diversity studies; BERA Table 3-1). These are all based on empirical site data and these lines-of-evidence cannot be used to determine effects to the benthic population through means other than empirical testing post -construction.

As noted above, EPA adopted the site-specific sediment quality values from the BERA for the RAO 5 PRGs. EPA made the risk management decision to not address all unacceptable benthic risk through dredging and capping and allow for some unacceptable benthic risk to be addressed through MNR. However, in conducting the evaluation of alternatives, it is necessary to discuss the overall protectiveness. EPA made a risk management decision to evaluate overall protectiveness for RAO 5 in the 2016 feasibility study (Section 4.1.3, RAO 5) as:

> "*The protection of benthic species to contaminated sediment is evaluated using the benthic risk area defined by an order of magnitude greater than the RAO 5 PRGs. The post-construction interim target for RAO 5 was established at 50 percent reduction in the area posing unacceptable benthic risk. This is acceptable because protection of the benthic community is based on a population rather than individual effects, and is considered a target to which the benthic population as a whole can be stressed and still recover, in conjunction with the uncertainty associated with the predictive models used to develop these PRGs*."

Thus, the 2016 feasibility study used the same metric as all other RAOs in establishing an interim goal that was an order of magnitude greater than the PRGs. EPA made this risk management decision based on the conservativeness of the sediment quality values used in the models (see BERA Section 6.2.5). EPA made further risk management decisions that the entire area above the RAO 5 PRGs did not need to be addressed through capping and dredging and made an assumption that if 50 percent was addressed through active remediation, the other 50 percent would be addressed through MNR. Since benthic effects from contaminated sediment are due to reproduction and growth, not just survival, this approach would also ensure that the entire population was not diminished through active remediation (capping and dredging is assumed to kill benthic organisms where it occurs).

The sediment PRGs developed for RAO 5 (reduce risk to benthic organisms from ingestion of and direct contact with COCs in sediment to acceptable exposure levels) considered the tissue residue line of evidence, and the two site-specific predictive models of toxicity to benthic species. PRGs for the tissue residue line of evidence were estimated using benthic tissue residue values and site-specific biota sediment accumulation factors. Site specific predictive models included the Logistic Regression Model and the Floating Percentile. The details of these approaches are described in Section 6 of the BERA. The lowest of these values for a given contaminant was selected as the RAO 5 PRG. COCs for which a site-specific value could not be developed (lindane and zinc) relied on sediment quality guidelines (McDonald 2000) and are used as the PRG. Water based exposures are addressed through RAOs 7 and 8. As described in Section 6 of the BERA, the evaluation of benthic risks due to exposure to contaminated sediment relied on sediment toxicity testing, site-specific predictive models, generic sediment quality guidelines and tissue residue concentrations. Thus, the PRGs presented in the final feasibility study consider all lines of evidence (including toxicity through the use of the predictive models) considered in the evaluation of benthic invertebrate risk in the BERA rather than a single predictive model.

As presented in Figure 2.2-2 of the final feasibility study report, areas of unacceptable benthic risk represent 1,289 acres of the Site. However, interim targets for risks and hazard indices were established to evaluate the potential for achievement of PRGs in a reasonable time frame. For RAO 5, the interim target is based on multiplying the RAO 5 PRG by an order of magnitude to account for further reductions due to MNR. In addition, the post-construction interim target for RAO 5 was established at a 50 percent reduction in the area posing unacceptable benthic risk. As explained above, this is because risks to the benthic community are based on a population level rather than individual level effect and 50 percent

considered a target to which the benthic population as a whole can be lost and still recover. As shown in Table 4.2-7 and Figure 4.2-25a of Appendix IV of the ROD, EPA's preferred alternative, Alternative F Modified addresses the majority of the Site (72 percent) that exceeds the RAO 5 PRGs by more than an order of magnitude (10x). Thus, the 2016 feasibility study report used the same metric as all other RAOs in establishing an interim goal that was an order of magnitude greater than the PRGs.

Regarding the basis for the RAO PRGs, the process to develop the PRGs is summarized in Appendix B and Table B4-1 of the feasibility study report. Table B4-1 presents the PRGs for each line of evidence considered, the source of the PRG and the PRGs used in the feasibility study report. The direct contact PRGs presented in Table B4-1 are based on the sediment quality values presented in Section 6 of the BERA (Tables 6-10, 6-12 and 6-18). As described in Section B4.1 of Appendix B, Logistic Regression Model sediment quality values based on organic content or percent fines normalization were converted to bulk sediment concentrations assuming the site-wide average sediment organic carbon of 1.71 percent and 53.38 percent fines from the BERA database. The approach for developing PRGs based on the ingestion of prey is presented in Section B4.2 of Appendix B of the feasibility study report.

As described in the ROD, additional data will be collected during remedial design for selection and design of the remedial technology to be implemented in specific locations. This may include toxicity testing, as applicable to refine delineation of benthic risk areas in areas that are not driven by risk via another RAO. Toxicity testing conducted for the Portland Harbor BERA 10-day survival and biomass test using the midge *Chironomus dilutus* and the 28-day survival and biomass test using the amphipod *Hyalella azteca*. These tests are included in the 2016 SEF for the Pacific Northwest (RSET 2016). Site specific sediment toxicity testing will include the two aforementioned test species. Interpretation of the result will be based on the acceptance criteria (hit definitions) outlined in the SEF.

2.35 Environmental Justice

2.35.1 Eliminate the CDF

Comment Summary

Four commenters wrote expressing concerns regarding environmental justice issues related to having a disposal facility in North Portland at Terminal 4. They were concerned that North Portland was unfairly being singled out as a dumping ground and a location for industry because it is a poorer, disadvantaged community.

Comments include:

- "Where are you going to carry out your final disposal method? Please don't dump it in North Portland. I understand that the esteemed city council has drawn a red line around North Portland having determined that anything or anybody that nobody wants in their back yard can just be stuck there."
- "I moved to St. Johns with my daughter and aging parents to start an educational toy and book store. This beautiful neighborhood is not the place I want to see toxic muck dumped. How is this not a bigoted decision? Drop the garbage in Portland's poor part of town. They won't pay attention or put up a fuss. Well, the area is changing, and we ARE paying attention. Please relocate your toxic dump site to a place that children and dogs do not play."

- "North Portland residents have had more polluting industries that many areas of Portland. The contamination from the Superfund cleanup should not be stored or left in the river. Remove the contamination."
- "The needs of communities most affected by the contamination in the Portland Harbor over the decades should be carefully considered. While the League cannot speak for them, we understand that cleaning up the Portland Harbor so that they and others can consume resident fish without concern of harming their health is of utmost importance. Furthermore, because these communities are neighbors to a number of environmental hazards due to industrial activity, siting a toxic waste dump (Confined Disposal Facility) in their vicinity would add insult to injury. EPA needs to pay particular attention to these communities when adopting and implementing the cleanup plan."

EPA Response

The final selected remedy will not employ a CDF at Terminal 4. The location of the CDF at Terminal 4, as described in the proposed plan (USEPA 2016c) was evaluated because the Port of Portland was a willing sponsor of the facility and the CDF location was within the Portland Harbor Site so that dredged material would not need to be transported a long distance. EPA recognizes that low-income and/or minority populations reside in areas adjacent to the proposed CDF location, as well as the Portland Harbor Site as a whole, and therefore environmental justice concerns were considered. EPA assessed the use of a CDF as a way to reduce impacts to surrounding communities that result from the transport of dredged material off site. However, given the significant community concerns received on the use of an on-site CDF, and the recent withdrawal of support by the Port of Portland for the Terminal 4 CDF, an on-site disposal in a CDF is no longer a component of the final cleanup decision (Section 2.14.1 of this responsiveness summary).

2.35.2 Improve Insufficient Outreach to Environmental Justice Communities

Comment Summary

A total of 1,354 comments were received regarding what was perceived to be EPA's lack of attention to environmental justice issues. The following two quotes were received as form emails or postcards and represent over 98 percent of the comments:

- "EPA should do a much better job of addressing environmental justice issues, including reviewing and correcting significant deficiencies in its public engagement strategies for future phases of the Superfund process and delineating strategies for ensuring the jobs, economic benefits and other benefits associated with the Superfund process to the local community and particularly to underserved communities that have been impacted by contamination in Portland Harbor."
- "This site presents characteristics of an Environmental Justice community, yet EPA has not addressed this issue. EPA needs to assess the EJ aspects of this site and take appropriate action to enhance protective and remedial measures."

The remaining comments echoed this theme. Several comments also referred to the lack of an environmental justice analysis. Representative comments are:

- EPA is failing environmental justice issues, particularly to historically (criminally) underserved communities. People in Portland notice and are calling you out. Take a stand, we are begging you.

- As detailed more explicitly in the comments we submitted with the Portland Harbor Community Coalition, the Portland Harbor Site must be assessed through the lens of Environmental Justice. We believe EPA has not adequately considered the EJ aspects of this site, so it must now take the appropriate action to enhance protective and remedial measures for the impacted communities.

- The proposed plan is a huge disappointment to me personally, and is especially damaging to the communities most impacted by the contamination, such as Native Americans, African Americans, Latinos, East Asian, Eastern European, houseless, and other immigrant / refugee groups. These communities face the harshest costs of a polluted river, such as displacement, exposure to toxins, and violations of treaty rights. I urge EPA and Oregon legislators to restore the Willamette today for all people and generations.

- I also have concerns that the analysis, and the proposed plan, did NOT deal adequately with social justice issues -- and that, once again, people of color and lower-income residents will be the ones who continue to be impacted the most by leaving so much pollution in the river.

- I was surprised that I could not find an analysis of the environmental justice dimensions of the existing situation or the impacts of the alternatives. I thought this was a required element of an EIS. It seems reasonable to assume that more complete cleanup of contaminants would improve their lives. Greater public access should be a goal of the entire process, and the public should have enough information about the process to know when to engage in the public decision processes at the state or local level to protect environmental justice interests. Agreements between impacted communities, polluters and government must be made to insure equity provisions are implemented during and following cleanup.

EPA Response

EPA takes environmental justice seriously and has worked to understand environmental justice concerns in the Portland Harbor study area and also spent significant time and resources on outreach to communities with environmental justice concerns. In an effort to integrate environmental justice and community engagement efforts, the proposed plan (USEPA 2016c) provided a short summary of the community groups that EPA worked with in addressing environmental justice issues related to the Portland Harbor study area. While the proposed plan listed some of the names of these organizations, EPA could have done a better job in highlighting the tremendous effort and work that occurred between community based organizations and EPA in order to address environmental justice concerns at the Portland Harbor Superfund Site. However, EPA did use existing methodologies that support environmental justice considerations and guiding principles for environmental justice analyses at the Portland Harbor Superfund Site. For example, the use of online tools is one of the methods for supporting environmental justice analyses. Web-based geographic information system mapping tools assisted the region in defining, delineating, and characterizing communities with environmental justice concerns. Region 10, in its effort to understand initial environmental justice issues for the Portland Harbor Superfund Site used EJ View, in screening the community demographics and subsequently in EJ Screen and the Community-Focused Exposure and Risk Screening Tool (C-FERST).

Detailed information is provided below about environmental justice work that was conducted at the Site.

- **Use of EPA's Environmental Justice Screen (EJSCREEN) tool at the Portland Harbor Superfund Site:** EJSCREEN is an environmental justice mapping and screening tool that provides EPA with a nationally consistent dataset and approach for combining environmental and

demographic indicators. An EJSCREEN analysis of the Portland Harbor Superfund Site was conducted which resulted in a demographic analysis of the study area and also the creation of a map that displayed this information. Specifically, the map displayed the areas of contamination at the Portland Harbor Superfund Site and marked locations where the population was under age 18, below the poverty line, spoke English less than well and had less than a high school diploma. Additionally, data reflecting the percentage of the population that was minority and the percentage of the population that was white in a 0.5-mile radius and 2.5-mile radius of the Site was displayed as well as per capita income and household income less than $15,000. This map was presented at community information sessions and meetings.

- **Use of EPA's C-FERST:** C-FERST links to and builds upon other community-focused guidance and tools to help identify human exposures and potential risks for a community and to help identify issues for further assessment and actions that are available to improve public health. EPA Region 10's environmental justice coordinator had multiple sessions with members of the Portland Harbor Community Coalition members to discuss and address environmental justice concerns and train coalition members to use a pilot version of the C-FERST tool to conduct analyses over the course of a year. Also, just this year, EPA has officially launched C-FERST and looks forward to continuing to work with coalition members and other interested groups to utilize this tool for environmental justice work.

- Application of EPA's six guiding principles for environmental justice analyses to determine any disproportionately high and adverse human health or environmental effects to low-income, minority, and tribal populations. These principles include:

    1. Consider the composition of the affected area to determine whether low-income, minority or tribal populations are present and whether there may be disproportionately high and adverse human health or environmental effects on these populations. This principle applies to Portland Harbor as follows:

        - EPA identified diverse neighborhoods, organizations, schools, businesses, religious institutions, the University of Portland, and government offices that are located within an approximate 2.5-mile radius of the Portland Harbor Superfund study area. Approximately twenty-four percent of people living within the area of the Portland Harbor Superfund Site are minorities; fifteen percent of homes are English as a second language households. Other communities, not necessarily living near the river, also recreate in the Portland Harbor area. These include Spanish-speaking, Vietnamese, Hmong, Chinese, Ethiopian, Somali, and Russian/Slavic communities.

    2. Consider relevant public health and industry data concerning the potential for multiple exposures or cumulative exposure to human health or environmental hazards in the affected population, as well as historical patterns of exposure to environmental hazards. This principle applies to Portland Harbor as follows:

        - The Baseline Human Health Risk Assessment considered and focused on vulnerable populations that included children, pregnant women, women who are breast feeding, tribal fishers, transient populations, including the houseless populations, and people who work in and around the Portland harbor study area. The full

Baseline Human Health Risk Assessment is available on EPA's Portland Harbor website at the following link: http://semspub.epa.gov/src/document/10/687176

3. Recognize the interrelated cultural, social, occupational, historical, or economic factors that may amplify the natural and physical environmental effects of the proposed action. This principle applies to Portland Harbor as follows:

   - Attending quarterly briefings with the Oregon Environmental Justice Task Force meeting to share information about the Site, public involvement opportunities and to hear ideas on how to better involve communities with environmental justice concerns. The Oregon Environmental Justice Task Force was created by the Oregon legislature to help protect Oregonians from disproportionate environmental impacts on minority and low-income populations.

   - Holding four public meetings in June and July 2016 during the public comment period for the proposed plan that were well advertised including posting translated notices in Spanish, Vietnamese and Russian publications. Language interpretation was available at all meetings upon request and was utilized at the June 24th meeting (Spanish, Russian, Vietnamese, and Chinese) and at the July 20th meeting in the evening (Spanish, Russian and Arabic).

4. Develop effective public participation strategies. This principle applies to Portland Harbor as follows:

   - Using novel outreach techniques to engage communities, such as workshops, ethnic festivals, children's water festivals, presentations to Native American Youth and Adults, Portland City and Earth Care summits, boat tours for stakeholders, Superfund 101 training and radio broadcasts. In addition, EPA developed and distributed multilingual materials and provided translation services upon request during information sessions.

   - Partnering with the Portland Harbor Community Coalition since 2012 to hear and address environmental justice concerns and the need for meaningful involvement at the Site. The coalition is comprised of individual community members, community of color organizations, conservation organizations, environmental justice organizations, higher educational institutions and tribes. EPA recognized that the coalition was able to conduct outreach to communities with environmental justice concerns and understands the needs of these communities. As a result, EPA wanted to connect and collaborate with coalition members. For example, in March of 2015 EPA conducted a Portland Harbor and Superfund 101 training entirely in Spanish for the Portland Harbor Community Coalition and Verde.

   - Engaging with many different groups that represent or are concerned about communities with environmental justice concerns such as Communities of Color, the Native American Youth Association, Latino Network, Right 2 Dream Too, Right 2 Survive, Willamette Riverkeeper, the Slavic Immigrant Association, Ecumenical Ministries of Oregon, the Coalition of Black Men, Oregon Tradeswomen, League of Women Voters, Verde, Portland Harbor Community Coalition, Sierra Club Portland, Occupy St. Johns, Audubon Society, Asian Pacific American Network of Oregon,

Vietnamese Community of Oregon, Portland neighborhood associations and schools. EPA has also used public information sessions, fact sheets, websites, one-on-one discussions, and participation in community events as ways to share information with the broader community. A detailed list of specific community involvement activities is available in EPA's current Portland Harbor Community Involvement Plan.

- Designing and disseminating the Portland Harbor Brain Bender Activity Book for students that has educational activities with math, geography, biology and word finds to help 6th – 8th grade students learn more about the Portland Harbor Superfund Site.

- Producing and disseminating quality information such as community information cards that outlined key information about the Portland Harbor Superfund Site in English, Spanish, Vietnamese, Russian and Chinese.

- Attending and presenting at public forums and meetings and also organizing multiple community information sessions in many different locations around the Portland area during January, February and March of 2016 in advance of the release of the proposed plan. At the EPA community information session at the Immigrant and Refugee Community Organization, EPA provided Spanish and Russian interpretation.

5. Assure meaningful community representation in the process, beginning at the earliest possible time. This principle applies to Portland Harbor as follows:

   - Holding focus groups and one on one meetings with representatives from the Portland Urban League and Coalition of Black Men, Groundwork Portland, Verde, and many organizations not represented by the Community Advisory Group. As a result, members of these community groups added input, participated in trainings, and advised EPA on appropriate ethnic venues for advertising meetings and how their members could best become informed about the Portland Harbor concerns. This allowed for EPA to actively and intentionally utilize the Chinese, Vietnamese, Hispanic and Russian news media, papers, newsletters, and/or diverse community announcements.

   - Providing interpretation services at the proposed plan public meetings upon request and providing materials that were translated into Spanish, Russian, Vietnamese, and Chinese. Meetings were provided at different times of the day and evening and in multiple locations.

   - Providing financial support to the Willamette Riverkeeper since 2001 via a technical assistance grant. The Willamette Riverkeeper has used this grant to give support to the CAG which provides a public forum for community members to learn about the Site and share community needs and concerns, including environmental justice concerns. EPA intends to continue providing this financial support as long as there are community organizations that are able to maintain the technical assistance grant.

- Collaborating with DEQ and the Oregon Health Authority to reach out to underrepresented communities that are not involved with the CAG to hear their voices and to seek resources outside the scope of the Superfund program that may support community objectives.
- Providing environmental justice training to the Community Advisory Group by the environmental justice community liaison along with presentations and training on job readiness to the Oregon Task Force, Oregon Tradeswomen and the Portland Harbor Community Coalition. Superfund 101 sessions were provided on a Saturday for community members where representatives from Right 2 Survive and the houseless community attended and provided input.
- Providing and disseminating quality information during the release of the proposed plan, specifically a community fact sheet as well as an acronym, glossary, contaminant summary and a handout detailing how to give written or oral comments that were all translated into Spanish, Vietnamese, Chinese and Russian. Additionally, EPA posted translated notices about the release of the proposed plan in Spanish, Vietnamese and Russian publications.

6. Seek tribal representation in the process. This principle applies to Portland Harbor as follows:
   - There is significant information regarding tribal engagement in the proposed plan and the community involvement plan listed on the Portland Harbor website. Additionally, please find more information about tribal engagement in Section 3 (Tribal Comments and Responses) of this responsiveness summary.

In summary, EPA recognizes that many commenters felt that environmental justice concerns need to be given more attention as EPA moves forward with remedial design and remedial action at the Portland Harbor Superfund Site. Transparency is a key value of EPA and as we move forward, we seek to continue to demonstrate our commitment to making a visible difference in the communities we serve. EPA looks forward to continuing to collaborate and work with the groups outlined above and also form new relationships with others who can help us conduct better outreach to communities with environmental justice concerns. Lastly, the upcoming required revision to the Portland Harbor Community Involvement Plan will provide another opportunity to discuss and explore these ideas and issues more deeply.

Please also see the following responses in this responsiveness summary to other comments that address these topics:

- EPA's post-ROD outreach plans (Section 2.36.2)
- Financial support to communities with environmental justice concerns (Section 2.36.5)
- Outreach associated with the proposed plan (Section 2.36.1)

2.35.3 Consider Food-Based Environmental Justice Issues

Comment Summary

Ten personal comments were received from the public, including the *Oregon Physicians for Social Responsibility*, that related specifically to environmental justice because of the lack of fish that were safe for the Native peoples, people of color, and low-income groups.

Representative comments include:

- Like many middle-class Oregonians, there is no way I would gamble on eating the fish from the Willamette. Nothing in the current plan would dissuade me from that. However, lots of people don't have the choice that I do. The current plan ensures that the impact would continue to fall disproportionately on the poorer communities that rely on the Willamette.
- In the time I spend on the river, I also disproportionately see people of color and low income folks fishing in the Superfund site. They are the ones whose health is most impacted, and social justice demands that we protect everyone who uses the river, especially those who depend on it to supplement their diets.
- How environmental justice issues - specifically how people of color, Native Americans, low-income households and others disproportionately affected by bio-accumulative contaminants and by continued fish consumption advisories due to their reliance on fish from the Willamette River for cultural and nutritional purposes - will be addressed."
- Failure to clean the river to a level at which fish are safe for human consumption renders the cleanup a classist and racist action: The populations that most heavily use the river are people who are homeless and Native American communities, as well as some of the Black communities that have already are subject to the most polluted areas of the city.
- The Preferred Alternative I is chosen because it is relatively less expensive and will require only seven years of construction, rather than 60 years to conduct the cleanup. And yet still it will not permit fish from the harbor to be consumed by subsistence fishers. This is a serious violation of environmental justice values and one that EPA should take seriously
- We also call on EPA to require the most effective cleanup technologies available, regardless of cost, to fully clean up the Portland Harbor in a way that does not harm Pacific lamprey eel that are embedded in the sediment as long as 7 years. Scientific evidence suggests that Pacific lamprey, which have been in existence for over 500 million years, are one of the foundational species of the Columbia basin, and that the potential loss of Pacific lamprey in the Columbia basin threatens the basin's ecological integrity. Lamprey is also an incredibly important cultural food, and provide a very important source of nutrition, as they are exceptionally rich in fats (much more so than salmon). Due to the loss of lamprey throughout the Columbia Basin, many young tribal members have never even seen a lamprey, and are losing historically important stories and ceremonies that are associated with them.
- EPA must recognize that environmental restoration is not a discretionary function -- it a fundamental issue of justice at the heart of EPA's mission. Environmental restoration is necessary for the restoration of the traditional cultures of the Pacific Northwest, who currently suffer from severe health problems as a result of the disruption of their traditional food sources -- including salmon, lamprey, and wapato in the Portland Harbor."
- A human health risk assessment was performed for the Site which showed that health risks from exposure to contaminants in the river are highest for populations consuming large amounts of resident fish from the Site. As a result, it makes sense that areas used more frequently by the most

impacted or underserved and underrepresented populations should have a more aggressive schedule for cleanup.

EPA Response

Executive Order 12898 directs federal agencies, including EPA, to identify and address environmental justice concerns for minority populations and low income populations to the maximum extent feasible. The primary purpose of CERCLA is to remediate releases of hazardous substances to the environment that are presenting unacceptable risk to human health and the environment. As a result of public comments like the ones outlined above regarding environmental justice and fish consumption, EPA has chosen a more aggressive cleanup option on the releases of hazardous substances to the Site that will allow for additional fish consumption after construction of the remedy is complete. However, current background contaminant levels coming into the Site will still make it difficult for those most at risk (such as Native Americans, subsistence fishers and women who are breastfeeding) to consume an unlimited quantity of fish. Fish advisories due to contamination at the Site would be modified based on the results of long-term monitoring of contaminants in fish tissue and fish tissue surrogates (such as passive monitoring, where necessary). Watershed-wide planning efforts by the Oregon DEQ, EPA and other groups may eventually reduce background contaminant concentrations and further increase fish consumption, although the Oregon Health Authority may still impose a fish advisory based on broader watershed risks.

In the meantime, EPA does support some of the specific environmental justice recommendations for fish consumption that were received during the public comment process such as prioritizing areas for cleanup that have high public use and increasing riparian-area signage for fish advisories. EPA already has engaged communities with environmental justice concerns on fish advisories and will apply this to future fish advisory work. In 2012, EPA started a revision project for the Portland Harbor fish advisories and discussed changes to the signs with the CAG, five neighborhood associations and representatives from the Slavic, Tribal, Latino and Vietnamese communities. From these discussions, EPA acquired valuable feedback to improve the fish advisory signs but also learned that we should better utilize non-profit organizations representing the various communities to communicate information, attend community association festivals, go to ethnic celebrations and submit articles to community newsletters. As a result of this previous fish advisory revision effort, EPA has already formed relationships with other non-profit groups and has attended additional events such as the Slavic Celebration in June. In the future, EPA intends to continue applying these suggestions to upcoming work regarding fish advisories and to facilitate participation by communities with environmental justice concerns.

Please also see the following responses in this responsiveness summary to other comments that address these topics:

- EPA's post-ROD outreach plans (Section 2.36.2)
- ICs (Section 2.28.1)

2.35.4 Consider Specific Suggestions for Additional Environmental Justice Support

Comment Summary

Fifteen comments were received that requested additional environmental justice actions. Requests include:

- Work with impacted communities to set aside land on or near the river for community use which could support community-controlled habitat restoration, housing, gardens, environmental education, and other community-identified and community-controlled activities.
- Establish Community Benefit Agreements with private-sector actors, ensuring equity-supporting redevelopment outcomes in the Harbor area, including expansion of living-wage jobs, affordable housing, and targeted outreach to bridge food and housing insecurities for disproportionally impacted groups relying on the Harbor area for basic needs (from the Health Impact Assessment submitted with the Portland Harbor Community Coalition comments titled *Portland Harbor Superfund Cleanup: Socio-Environmental Determinants of Health & Vulnerable Communities*).
- Formulate policy mechanisms to incubate equity-supporting economic activity in the Harbor, including microenterprises, light industry, and other entrepreneurship opportunities, toward growing the living-wage job market, with leadership by local residents and members of affected communities (from the Health Impact Assessment submitted with the Portland Harbor Community Coalition comments titled *Portland Harbor Superfund Cleanup: Socio-Environmental Determinants of Health & Vulnerable Communities*).
- Provide information to communities with environmental justice concerns in culturally appropriate ways, such as by ensuring that materials are translated and also disseminated by working with organizations who have established trust relationships with environmental justice groups affected by the contamination.
- Improve public engagement actions moving forward to address all environmental justice issues, engage more effectively with people living around the river and correct other deficiencies in EPA's public engagement strategies.
- Ensure that communities with environmental justice concerns have enough time to provide adequate comments on the cleanup plan for the Site.
- Change zoning to ensure that ceremonial land is given back to the tribes.

EPA Response

As noted in previous responses, EPA believes that everyone deserves to be protected from pollution, not just those who can afford to live in the cleanest, safest communities. Executive Order 12898 directs federal agencies, including EPA, to identify and address environmental justice concerns for minority populations and low income populations to the maximum extent feasible.

EPA values the thoughtful comments and ideas that were submitted regarding additional environmental justice actions that should be conducted at the Site and we look forward to discussing the specific recommendations as remedial design and remedial action move forward. For example, EPA is committed to providing information to communities with environmental justice concerns in culturally appropriate ways and will continue to improve public engagement actions by working with the CAG, the Portland Harbor Community Coalition, Willamette Riverkeeper, Communities of Color, Native American Youth Association, Latino Network, Right 2 Dream Too, Right 2 Survive, the Slavic Immigrant Association, Ecumenical Ministries of Oregon, the Coalition of Black Men, the Oregon Environmental Justice Task Force, Oregon Tradeswomen, League of Women Voters, Verde, Sierra Club Portland, Occupy

St. Johns, Audubon Society, Asian Pacific American Network of Oregon, Vietnamese Community of Oregon, Portland neighborhood associations and schools, and any other interested parties.

Many of the concerned expressed by residents however appear to be outside the jurisdiction of EPA under CERCLA authority and EPA is limited in what it may do under existing authorities. We encourage the state to work with the appropriate organization to ensure that land use planning, housing, reuse of surrounding properties are considered in the overall planning for the area. Please also see the following responses to other comments in this responsiveness summary that address these topics:

- EPA's post-ROD outreach plans (Section 2.36.2)
- Hiring locally (Section 2.2.2)
- EJ and job creation (Section 2.35.6)
- EJ and financial support (Section 2.35.5)
- Relocation and housing issues for communities with EJ concerns (Section 2.35.7)

2.35.5 Address Issues of Financial Support Related to Environmental Justice

Comment Summary

Several comments were received that discussed providing financial support for communities with environmental justice concerns or funding independent community organizations to provide outreach to communities affected by the Site, particularly to communities of color and economically disadvantaged community members. Some of the specific suggestions offered by commenters about actions EPA could take to provide financial support to communities with environmental justice concerns include:

- Establish a fund to assist communities impacted by historic and ongoing contamination.
- Fund a study to determine where the most vulnerable communities are conducting activities along the river.
- Provide financial support to the CAG and the Portland Harbor Community Coalition to conduct effective community outreach to low income, Native American, minority and immigrant communities who are impacted by the cleanup actions.

EPA Response

EPA appreciates the comments and suggestions from commenters regarding financial support to better understand the needs of communities with environmental justice concerns and also to conduct quality outreach to the most vulnerable communities affected by the Site.

EPA looks forward to exploring these ideas with community members, to the extent that these are within the scope of the CERCLA response, as we move forward with remedial design and remedial action. Specifically, the upcoming required revision of the Community Involvement Plan for the Site may be an opportunity to have discussions about these ideas with the groups that have developed trusted relationships with the most vulnerable communities and also directly with community members who have environmental justice concerns.

EPA also is already considering ways to address some of the specific suggestions that were raised in the comments, such as a study to determine where the most vulnerable communities are conducting activities along the river. As part of the ICs implementation and assurance plan that lays out the approach for the development and implementation of ICs like fish advisories, EPA may conduct a survey of fisher communities, including Tribal, low-income, minority and immigrant communities, to verify the fish species being consumed, consumption rates, preparation and cooking practices (Section 2.28 of this responsiveness summary).

Additionally, EPA has provided financial support to the Willamette Riverkeeper since 2001 via a technical assistance grant. The Willamette Riverkeeper has used this technical assistance grant to give support to the CAG which provides a public forum for community members to learn about the Site and share community needs and concerns, including environmental justice concerns. EPA intends to continue providing this financial support as long as there are community organizations that are able to maintain the technical assistance grant and that the effort is within the scope of the CERCLA response.

Lastly, EPA also intends to maintain our strong partnerships with local, state and federal partners who also may be able to provide financial support to benefit communities with environmental justice concerns during the cleanup. For example, the Oregon Health Authority implemented a mini-grant application program from 2003-2009 which provided funding to community organizations to enhance outreach efforts to different ethnic groups and specific populations that catch and consume fish from the Site.

Please also see the following responses to other comments in this responsiveness summary that address these topics:

- EPA's post-ROD outreach plans (Section 2.36.2)
- Relocation and housing issues for communities with environmental justice concerns (Section 2.35.6)
- Hiring locally (Section 2.2.2)

2.35.6 Support Job Creation in Impacted Communities

Comment Summary

Seven commenters discussed the importance of ensuring that job training, jobs and other economic benefits are made available during cleanup, particularly to underserved communities, communities of color, low income people, women and other underrepresented groups impacted by the long-standing contamination. These comments came from the general public, as well as the Portland Harbor Community Coalition and the CAG.

Comments include:

- "Public engagement strategies used for the clean-up plan have not well-addressed environmental justice, specifically delineating strategies for ensuring the jobs, economic benefits and other benefits associated with the Superfund process are accessible to the local community and particularly to underserved communities that have been impacted by contamination in Portland Harbor. EPA is strongly urged to redress these deficiencies from this point on in the Superfund process."

- "Heavily consider the environment justice issues by assuring jobs, and benefits to the underserved and local communities that have been impacted by the Superfund sites."
- "EPA should do a much better job of addressing environmental justice issues by ensuring that the jobs and economic benefits of the cleanup are shared by the communities most impacted by the long-standing contamination."
- "The plan should ensure the jobs, economic benefits and other opportunities associated with the cleanup accrue to underserved communities and communities of color that have been impacted by contamination and reduced access in Portland Harbor."
- "I've worked on projects in a city outside of Portland, where the City went into contract with the large companies and required them to provide apprenticeships and internships that would focus on low income people, people of color, and women, and underrepresented people. I would also like to see the industries along the river -- and I was a member of the River Renaissance Committee years ago -- to require them to put money into a fund that would support this job training. I think these are very basic environmental justice principles where the benefits and the burdens of the action are equitable. So it's important for the community people to benefit."
- "Attract federal investment (e.g. Superfund Joint Training Initiative) and commit local resources (e.g. via Jobs with Justice) to job training and workforce development for mid-skill, living-wage jobs in the environmental and construction industries."
- "Hiring for the cleanup should be kept local whenever possible, so that communities that have suffered the most exposure to contamination also benefit by the positive opportunities offered by the cleanup."

EPA Response

EPA supports all of the comments that were received regarding job training, jobs, local hiring and other economic benefits that should be made available for communities with environmental justice concerns during site cleanup. EPA often has some support available to address these suggestions such as the long-standing program called the Superfund Job Training Initiative. The initiative is a job readiness program that provides training and employment opportunities for people living in communities (including communities with environmental justice concerns) affected by Superfund sites. EPA's goal is to help these communities develop job opportunities that remain long after a Superfund site has been cleaned up. EPA is already starting to explore how the initiative may be applied to the cleanup work at the Site.

Additionally, EPA is looking forward to continuing our existing partnerships with our community, Tribal, local, state and federal partners as well as forging new collaborative relationships to ensure that communities with environmental justice concerns reap economic benefits from the Site cleanup. EPA welcomes and encourages continued feedback from commenters and our partners on this important topic throughout the cleanup process.

Please also see the following responses to other comments in this responsiveness summary that address these topics:

- EPA's post-ROD outreach plans (Section 2.36.2)
- Hiring locally (Section 2.2.2)

2.35.7 Address Environmental Justice in Regards to Relocation Housing

Comment Summary

Many comments were received by EPA regarding the houseless community living around the Site as well as displacement and general affordable housing for low and middle income residents. Some specific suggestions were provided by commenters, such as:

- Provide adequate notice before starting the cleanup in areas where houseless people are living.
- Provide funds for permanent, affordable housing for anyone displaced by the cleanup (whether housed or houseless).
- Institute robust anti-displacement provisions (as outlined in the City of Portland's Comprehensive Plan) to ensure that low- and middle-income residents have access to permanently affordable housing in nearby neighborhoods.
- Encourage compensatory affordable housing with tax-incentives and other levers to increase affordable housing near the Site. Activate partnerships for community-guided development decision-making-targeting for involvement the vulnerable groups discussed herein (from the Health Impact Assessment submitted with the Portland Harbor Community Coalition comments titled *Portland Harbor Superfund Cleanup: Socio-Environmental Determinants of Health & Vulnerable Communities*).
- Link affordable housing preservation and development with market outcomes following the cleanup, for example, with directives to increase affordable housing in line with capitalization of the nearby housing/land market (i.e. an increase in mandated affordable housing would accompany a rise in average rental rate over time) - (from the Health Impact Assessment submitted with the Portland Harbor Community Coalition comments titled *Portland Harbor Superfund Cleanup: Socio-Environmental Determinants of Health & Vulnerable Communities*).
- Assure that working-class homeowners, including homeowners of color, capture the benefits of owning higher-value property, by offering community counseling on managing property taxes, refinancing, as well as code and permitting procedures for property improvements and rental-conversion.

EPA Response

EPA appreciates the many concerns and suggestions that were provided by commenters regarding the houseless community as well as displacement and general affordable housing for low and middle income residents. EPA does not anticipate that any resident will be displaced from their home as a result of the Site cleanup. If for some unanticipated reason, this does become necessary EPA has a well-established relocation guidance that has been successfully applied at many other sites throughout the country. For any relocation activities, EPA always provides early and frequent communication with the affected residents.

Regarding any displacement that would occur for members of the houseless community, EPA will make every effort to notify houseless community members in areas where cleanup activities are anticipated to occur as soon as possible before the start of any remedial action. Additionally, EPA intends to work closely with groups representing the houseless community such as Right 2 Dream Too, Right 2 Survive and any other interested organizations or individuals to facilitate communication of future cleanup

activities in areas that could affect houseless community members, and EPA will work with local authorities (such as the Oregon Department of Human Services) to connect houseless community members with any available resources.

EPA also looks forward to discussing other suggestions regarding housing and displacement that fall under the scope of CERCLA and the NCP as we move forward with remedial design. Other suggestions, such as community counseling for homeowners, may be better executed by other local, state or federal groups and EPA will help facilitate these connections wherever possible.

2.36 Public Participation

2.36.1 Address Public Outreach Related to the Proposed Plan or Earlier

Comment Summary

A total of 44 comments were received relating to public participation leading up to and including the proposed plan. All of the comments are personal comments. Roughly half of the comments requested an extension of the comment period, generally ranging from an additional 120 to 180 days, and several said that the timing of the comment period (summer) was poor. The remaining commenters stressed a need to better engage the public, either leading up to or during the comment period. One person thought that the format of the public meetings was flawed and that EPA should have agreed to additional meetings with a more traditional format, two people stated that it was wrong for people from Washington to be making decisions on the Site, one person was unhappy with email glitches at the beginning of the comment period, and a few people offered suggestions on improving future meetings.

Representative comments included:

- "I would like to see them seek more input from Portland residents. We have a right to voice our opinion on these issues, and certainly when it comes to our tax dollars."
- "Improved understanding of the plan's details and merits among concerned community members would improve cleanup implementation and acceptance. In this regard, we request that EPA and DEQ provide financial and technical resources to local organizations that are better equipped to directly engage local stakeholders about the merits and justification of the cleanup plan."
- "There has not been a full buy-in from the community, including the CAG, the city and the state. CAG has dedicated years and extensive time to this issue and their opinions should be taken into consideration and heard during this process. To date, this has not been the case."
- "It's unfair that EPA is working with people in Seattle who have no connection to us. Instead, they should be working with people in Portland or in the state of Oregon. This plan will not affect anybody in Washington, unless that's where the debris will be dumped. It will, however, affect us. EPA needs to start working with us instead."
- It is deeply disappointing that after months of delay, EPA still does not appear to have adequate systems in place to maximize the efficacy of the limited comment period it has provided. It compounds an already challenging and controversial situation in which EPA has provided only 60 days for public comment, has subjected the public to serial delays, and has launched the comment period right at the start of summer break when many people are leaving town.

Three commenters thought that the public engagement process was allotted inappropriate time in order to meet the "political deadline" of a ROD by the end of 2016. These comments included:

- "Rushing through this process to meet a political deadline has the potential to short-change the long-term health of the Willamette, and the people who live near it, and use the river on a regular basis. The final structure of the ROD should not be influenced by verbal agreements between EPA leadership and politicians made years ago, or a desire to complete the ROD because of sheer political expediency."
- "All of this has been informed by an unrealistic timeline for a ROD. Peter deFur, the technical Superfund Advisor retained by the Community Advisory Group, told the public that for EPA to reach a ROD by the end of the year, they would have to work in record time once the comment period ends, and more likely than not, the ROD has already been written. Taken together, all of this creates serious doubt that what we have witnessed over the last few months was a meaningful public process."
- "We do not believe that EPA could reasonably consider and respond to the public comments that have been submitted and make appropriate modifications to the plan in the arbitrary timeframe that EPA has set for itself. EPAs preoccupation with the December 31 deadline suggests that the public comment period was little more than a cursory exercise. We urge EPA to take the time necessary to give full consideration to the concerns that have been raised and make modifications to the plan as warranted. EPA should take whatever time is necessary to thoroughly read and respond to public comments and make appropriate changes to the feasibility study and Clean-up Plan, rather than attempting to stay on an unrealistic and politically driven timeline of reaching a final record of decision by the end of the year. Prioritizing the finalization of the ROD by the end of 2016 would relegate the public process to little more than a cursory checkbox."

EPA Response

EPA understands that some commenters felt that they were not sufficiently engaged in the process prior to the proposed plan (USEPA 2016c) being issued. EPA is always striving for improvement in this area and made a significant community outreach effort to get input for the proposed plan and to prepare people to participate in the public comment period. These efforts included producing and disseminating quality information such as community information cards, fact sheets and videos; maintaining current information on EPA's Portland Harbor website; providing valuable information via the EPA Portland Harbor listserv; engaging with various organizations including groups representing people who live along the river; participating in one-on-one discussions; attending and presenting at public forums and meetings; and organizing multiple community information sessions during January, February and March of 2016 (Section 2.35.2 of this responsiveness summary).

EPA held tribal consultations during the public comment period with the Confederated Tribes of Grand Ronde, the Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation and the Nez Perce Tribe. EPA consulted with the Confederated Tribes of Siletz Indians during the first round of consultations prior to issuing the proposed plan. In response to EPA's invitation to consult during the public comment period, the Tribe told EPA that it did not wish to schedule another consultation. EPA also held four public meetings in June and July of 2016 (June 24, June 29, July 11, and July 20). These public meetings were well advertised via e-mail, posting on the Portland Harbor website, dissemination of media advisories, and directly posting EPA notices in The Oregonian, The Skanner, The Asian Reporter, El Hispanic News (translated into Spanish), KAHOH

(translated into Russian) and the Phương Đông Times (translated into Vietnamese). The meeting venues were widely spaced throughout the metro area (City of Portland Building, EXPO Center, University Place Conference Center, and the Ambridge Center). Two formal presentations of the plan were given at each meeting, followed by a question and answer period and an informal open house where the public could discuss the plan directly with EPA staff and ask questions one-on-one. At all public meetings, there were opportunities to provide both written and oral comments on the proposed plan for the record. Language interpreters were available in person at the June 24 meeting (Spanish, Russian, Vietnamese and Chinese) and at the July 20 meeting in the evening (Spanish, Russian and Arabic) and by telephone if needed at the June 29 and July 11 meetings. A community fact sheet as well as acronyms, glossary, contaminant summary, and a handout detailing how to give written or oral comments were available in English, Spanish, Vietnamese, Chinese and Russian at each public meeting. Based on feedback from the public, the format of the last meeting during public comment was updated based on real-time input from commenters. EPA appreciates the feedback from commenters on the presentations and will use these suggestions to improve future public meetings. Lastly, EPA intends to continue public outreach and participation after the ROD is signed (Section 2.36.2).

EPA acknowledges that during the first few days of the public comment period, the EPA e-mail for receiving comments (harborcomments@epa.gov) was not operational. We sincerely regret that inconvenience but want to clarify that these problems were fixed within a few days and the same day that these issues were identified, an alternate e-mail was quickly provided for commenters to utilize. EPA also moved quickly to grant another 30-day extension to the 60-day public comment period, for a total of 90 days.

EPA assures the public that all responses were read and evaluated as EPA developed a final cleanup plan in the ROD. Additionally, well before the public comment period opened, EPA anticipated that a large volume of comments would be received for the proposed plan. As a result, EPA ensured that sufficient EPA staff and EPA contractors were in place to maximize resources, efficiently process all comments received and provide the best technical skills for this project.

2.36.2 Improve Public Outreach After the ROD Is Signed

Comment Summary

Several people wrote about the need for continuing public outreach at the Site on specific topics. Many comments expressed a need for information to be shared with the community. Nineteen comments stated, “When the data are obtained for the remedial design, these must be shared with the community,” and “The community needs regular opportunities for input during the construction phase of the cleanup.”

The remaining comments were personal comments that touched on offers to help EPA with engagement, the need for multi-cultural education (especially about risks of eating fish and recreating in the river), engaging Portland citizens and those in outlying areas, remaining transparent, having accessible meetings, and communicating with the CAG during construction.

Representative comments

- “I will volunteer as much time and services as I can. I also propose an educational/celebratory event to take this opportunity to educate the public (young generations) about the underlying problems which have led to this pollution. i.e. sustainable living, human overpopulation and nourishing conscious evolution.”

- "I don't think these newcomers are being apprised of what they're exposing themselves and their children to. The area is a cancer hot spot. I have family members who have been afflicted by this and so I think that this needs to be included in the plan somehow."
- The plan should call for an increase in culturally specific education and outreach to communities disproportionately impacted by the consumption of contaminated fish."
- "The affected community around the Portland Harbor needs regular opportunities for input during the construction phase of the cleanup. These should be conducted at times of day and night which accommodate work schedules, provide childcare, and be conducted in accessible locations and languages."
- "Your transparency so far has been good. Thank you. Please be transparent re the ongoing measurement of success of the toxicity removal."
- "The ROD should contain a requirement for regular communication between EPA, DEQ and the CAG during the remedial design and construction phase of the cleanup. Residents are the largest group of stakeholders and those who literally own the river. They need to be included in all decisions about the river cleanup going forward."
- "It is necessary that the public has a reliable way to stay informed on the progress of the cleanup and be engaged. The City would like to work with EPA and other government agencies to ensure the long-term Community Involvement Plan meets the needs of our communities. The City looks forward to partnership opportunities with EPA and other local government agencies to ensure community perspectives are understood and considered in every stage of cleanup process. The City request that EPA reevaluate its current Community Involvement Plan to ensure it meets the needs of the public, and in particular our most impacted communities. We also request that EPA dedicate additional resources for engagement that is conducted in a culturally responsive manner."

EPA Response

EPA intends to continue public outreach after the ROD is signed. Effective outreach is key to the successful implementation of a remedy, and we sincerely appreciate the public's interest, information requests, and offers to help. EPA will also explore making data from the monitoring events available online to the public as EPA has during pre-ROD early actions.

We also value our established relationship with the CAG, other community groups and individuals, the tribes and other interested parties. EPA will work to continue those relationships and seek input from those groups throughout the design and construction phases of remediation. These connections will be particularly important as we work out the best ways to communicate the risks of eating resident fish from the river. The input of these groups will be instrumental to help ensure that the public receives quality information and that risks are well understood.

Furthermore, we understand the concern over health issues in the area and the need to effectively communicate the health risks associated with the Site. EPA intends to work with Tribal and community groups, as well as other federal, state and local organizations to identify the best methods to communicate these risks such as through planned work on the use of fish advisories (see Section 2.28.1

of this responsiveness summary for more information about planned outreach on fish advisories), fact sheets one-on-one discussions and workshops.

Lastly, EPA is required to reevaluate the community involvement plan for the Site before the start of the remedy design and, as a result, EPA will be conducting additional community interviews. EPA hopes to hear additional feedback and ideas during these community interviews to help inform future public participation and risk communication work at the Site. EPA will also include the Oregon DEQ, the City of Portland, as well as other interested groups in the reevaluation of the community involvement plan prior to the start of the remedial design.

Additional information is provided elsewhere in this document on public participation as it relates to environmental justice issues (Section 2.35 of this responsiveness summary) and the use of fishing advisories (Section 2.28 of this responsiveness summary).

2.36.3 Be Transparent in Decision Making

Comment Summary

Transparency was an issue seen in many comment submissions. The commenters believed that EPA needs to do a better job in communicating the reasoning behind EPA's decisions and approaches.

More specifically, the proposed plan lacks transparency with respect to:

- Cost effectiveness analysis/weighing the costs against the benefits of the alternatives both individually and relative to each other
- Short-term impacts of dredging and fish advisories
- Human health risk assessment substantially overstates the actual site risk and therefore calls into question all of EPA's risk management decisions for the Site
- Collaborative and transparent process between EPA and the community related to the economic opportunity that will result from the cleanup activities
- Transparent stakeholder engagement and uncertainty analysis related to sustainability
- Costs of the cleanup on the community

EPA Response

Some transparency-related comments pertain to technical issues, which are better addressed under those specific themed responses to avoid duplicative effort. For comments related to the cost-effectiveness analysis, see Section 2.22.1 of this responsiveness summary. For comments related to short-term impacts, see Section 2.20 of this responsiveness summary. For comments related to the BHHRA (Kennedy/Jenks 2013), see Section 2.34 of this responsiveness summary.

EPA agrees that seeking input and collaborating with the community is vital for a successful implementation of the remedy, and community acceptance is one of the nine criteria that EPA is required to evaluate under CERCLA. EPA has sought to be fully transparent in its decision-making approach since the Site was listed. For instance, EPA has developed a collaborative relationship with the CAG, which formed in 2002 and is comprised of individuals from neighborhood associations; environmental, health, recreation, and business groups; and concerned citizens. The CAG provides a public forum for community members to learn about the Site and share community needs and concerns.

The CAG provided input and feedback to EPA and DEQ so that community perspectives were considered in the remedy selection process. Since 2002, EPA has continuously shared information and met with the CAG and the public about the Portland Harbor investigation and cleanup activities. EPA also has formed collaborative relationships with the tribes and other community groups involved with the Site over the years which also provided feedback and information to EPA on the proposed cleanup plan. A detailed list of EPA's collaborative efforts over the last few years is available in the 2016 *Portland Harbor Community Involvement Plan*.

Additionally, EPA conducted extensive community outreach in the months leading up to the release of the proposed plan (USEPA 2016c) and went well beyond the typical rollout of a proposed plan during the public comment period. In January, February, and March of 2016, EPA organized multiple community information sessions to inform the public about the Site and the forthcoming release of the proposed plan and public comment period. During the public comment period for the proposed plan, EPA held 4 public meetings and extended the public comment period to 90 days. EPA intends to continue public outreach after the ROD is signed. See Section 2.36.1 of this responsiveness summary for additional details about public outreach related to the proposed plan.

EPA assumes that the comment regarding the need for an "uncertainty analysis" for a sustainable remedy refers to the "uncertainty in risk and hazard estimates". EPA performed an uncertainty analysis of each alternative to determine the likelihood that the alternative would be protective. This analysis was presented in Appendix I of the 2016 feasibility study report (USEPA 2016b).

EPA appreciates the concerns of the local workforce and businesses as important segments of the community. EPA is aware that other entities have been studying the economic impacts of the cleanup. For example, the City of Portland commissioned a 2012 economic study specific to the Superfund cleanup entitled *Economic Impacts of the Portland Harbor Superfund Site Cleanup* (Econorthwest 2012). A City of Portland press release described some of the findings from this study as: "clean-up will inject new spending into Portland's regional economy and support jobs;" and "for every dollar spent on cleanup, more than a dollar in additional spending will be generated in the Portland economy as those employed in the cleanup purchase other goods and services in the region." EPA believes that moving forward with the cleanup will enable properties to be more readily developed which in some cases have sat idle for years due to contamination issues.

2.37 Agency Roles and Cooperation

2.37.1 Require Federal Oversight of Cleanup

Comment Summary

Thirty-five comments were received Indicating EPA should maintain federal oversight of the cleanup Roughly 73 percent were form comments received by email and stated:

- "The US EPA should lead the cleanup effort after the ROD, not the State of Oregon."

The remainder of the comments were personal comments expressing the same sentiment. They included:

- "Maintain federal oversight of Willamette River cleanup - do not delegate to the State of Oregon."

- "Please do not pass responsibility for the clean-up to the state of Oregon. It is clearly EPA's duty to lead this project for years and years. That is what we want from the national EPA"
- "We believe EPA should lead the cleanup implementation effort after the ROD, and not the State of Oregon. While Oregon has an important role to play as this cleanup plays out, we do not think they should be leading the cleanup process."

The most detailed request came from the Audubon Society and read in part:

- "We understand some PRPs and potentially, the State of Oregon are encouraging EPA to turn over all or a portion of the oversight of the clean-up of Portland Harbor to the Oregon DEQ. Audubon strongly opposes any increase in the oversight role of DEQ and recommends that EPA assert strong oversight over the uplands that to date have been the primary responsibility of DEQ. We recognize that DEQ has an important role to play in the cleanup of Portland Harbor. However, that role should be subservient to EPA and any DEQ role should carefully defined in the ROD with clear benchmarks including timelines for implementation, outcomes and monitoring and that EPA should retain full oversight of DEQ activities. We are concerned that DEQ is far more susceptible to pressure from PRPs and politicians than EPA. It is also notoriously underfunded and subject to pressure and punitive action via the Oregon legislature through the budget process. Finally, DEQ is currently at an all-time low in terms of public trust and public confidence in Portland as a result of recent scandals involving air quality in our community. It is notable that confidence in DEQ is so low right now that Portland's next Mayor, Ted Wheeler, has indicated that he may support the creation of a local air quality authority. Under these circumstances, it would be an unconscionable abrogation of EPA's oversight responsibilities to transfer any additional responsibility to DEQ. EPA should not delegate its federal trust authority to the State of Oregon. We urge EPA to retain full oversight responsibility for the Cleanup of Portland Harbor and ensure that any role that DEQ plays within that context is explicitly defined with clear timelines and benchmarks for success, monitoring, transparency and public involvement under the supervision of EPA."

EPA Response

The Site NPL listing includes releases to the Willamette River and all upland sources of those releases. Roles and responsibilities for coordinating the cleanup and natural restoration of the Site are outlined in the 2001 MOU that EPA signed along with DEQ, six federal recognized tribes, National Oceanic and Atmospheric Administration, Oregon Department Fish and Wildlife, and the U.S. Department of Interior. DEQ was designated the lead for upland source control and EPA is designated lead agency for the in-river portion of the Site. Although MOU partners have participated and provided support in upland source control activities, development of the remedial investigation report (USEPA 2016a), feasibility study report (USEPA 2016b), and proposed plan (USEPA 2016c), EPA retains overall authority for the Site under CERCLA. At this time, it is anticipated that the roles established for DEQ and EPA in the MOU will remain the same in large part.

In order to maximize resources and achieve cleanup as soon as possible, there may be an opportunity for DEQ to perform certain technical oversight functions, in coordination with EPA, at specified areas of the in-river portion of the Site. Any oversight functions performed, whether performed by EPA or DEQ, will comply with CERCLA, the NCP, the ROD, any CERCLA agreements reached between the agencies and work parties.

2.37.2 Require DEQ Oversight of Groundwater Cleanup and Other Issues

Comment Summary

Comments received on this topic are all from local businesses. Six comments said that the Oregon DEQ should be the lead agency for addressing groundwater. Five commenters wanted their current and/or previous source control measures to be included in the proposed plan, as well as DEQ's acceptance of the source control measures. Some commenters stated that COCs in groundwater at their facility do not pose a threat to the Willamette River, and that this has been accepted by DEQ. Five commenters also stated that the ROD should be written to exclude groundwater.

EPA Response

Cleanup of contaminated groundwater originating in the uplands will continue to be managed by DEQ under a MOU discussed in Section 2.37.1 of this responsiveness summary which established the framework for roles and responsibilities for addressing the Site. Because groundwater plumes are known to or have the potential to extend into the river and may recontaminate sediments that have been remediated and may continue to load to surface water, EPA proposed and selected in-river actions to address contaminated groundwater, where appropriate. It is generally expected that upland source control of contaminated groundwater will be addressed at each facility before the in-river remedy occurs. Remedial design sampling will be required to establish the actual footprints of groundwater plumes in-river and may also confirm that some of the suspected plumes are not significant sources discharging to the river that would interfere with achieving the RAOs and cleanup levels for the Site.

Early source control actions conducted under DEQ authority are not final CERCLA actions. EPA will evaluate the effectiveness of DEQ source control actions with final cleanup objectives and determine if further action is warranted. If early source control actions meet the requirements of the ROD, EPA will not require further action. EPA cannot make such a determination in the feasibility study, as it predates the ROD, but EPA did assume that all sources, other than river banks, are controlled in the 2016 feasibility study report (USEPA 2016b). However, there may be upland groundwater plumes that have migrated beyond the upland control point and may need further control in-river (via a sediment cap or amendment to a sediment cap).

Site-wide monitoring will be conducted prior to remedy design and will include an evaluation of COCs in groundwater discharging to the Willamette River. A monitoring plan will identify appropriate points of compliance relevant to the site-specific circumstances. Although some source control evaluations reports may have concluded that groundwater at the facility is not discharging COCs to the Willamette River at concentrations above PRGs, these conclusions may not have been accepted by EPA.

For example:

- Attachment A of comments submitted by Brix presents the estimated extent of petroleum-contaminated groundwater at the facility; but the extent of the plume was only estimated and groundwater or pore water monitoring between the leading edge of the plume and the Willamette River was not conducted. It is unclear why the extent of petroleum-contaminated groundwater was not identified in the Brix source control evaluations.
- A weight-of-evidence evaluation was not completed for the Gunderson facility for groundwater. TPH-diesel was detected in the most recent round of groundwater monitoring at MW-77 at a concentration of 577 micrograms per liter; MW-77 appears to be located approximately 50 to 75

feet away from the Willamette River and indicating a complete pathway for COCs to the Willamette River.

- During review of the source control evaluations for Shore Terminals, EPA requested additional groundwater monitoring to demonstrate that the groundwater plume originating at the Fuel Loading Rack Area is not migrating to the Willamette River. Shore Terminals comment that "*According to the Oregon Department of Environmental Quality, groundwater at the Shore Terminals Portland Terminal (Facility) is not impacting the River and the ROD should not include a requirement for groundwater treatment (a reactive cap) offshore of the Facility*" did not include a reference to identify the source of DEQ's decision; therefore, this statement cannot be evaluated. The Portland Harbor Upland Source Control Summary Report (DEQ 2016) describes that a source control decision has not been made for the Shore Terminals (ECSI #5130) and former ExxonMobil (ECSI #151) sites.

In response to specific commenters:

- A groundwater plume at the Knife River-Northwest facility was not identified in the proposed plan (USEPA 2016c).
- EPA acknowledges that source control measures at the Time Holding Co. facility were implemented to mitigate the groundwater pathway to the Willamette River, but a groundwater plume is still present and performance monitoring is ongoing.
- EPA acknowledges that source control measures at the Premier Edible Oils Site were implemented to mitigate the groundwater pathway to the Willamette River, but a groundwater plume is still present and performance monitoring is ongoing.
- DEQ is currently working with Gunderson to evaluate source control measures and groundwater monitoring is on-going.

Specific examples of when additional action may be needed to address groundwater include the Gunderson and Brix Maritime Co.'s (Brix) facilities.

- Gunderson has not conducted adequate sampling to characterize the nature and extent of the groundwater plumes at their property. For example, the source control evaluations report described trichloroethene at a maximum exceedance ratio of 102 times the Joint Source Control Strategy SLV at SWM-12; but adjacent monitoring wells were not sampled to delineate the extent of the groundwater plume. Further, there have been no source control actions taken at this property to control the groundwater plumes. Contaminants of concern will be monitored prior to remedial design to ensure that the pore water is not impacted such that a reactive layer in a cap or some other upland control may be necessary to ensure preliminary remediation goals are achieved.
- At the Brix facility, groundwater monitoring results are only discussed for monitoring wells outside of the groundwater plume in the source control evaluation report. Groundwater data for monitoring wells within the estimated extent of the groundwater plume should be presented to help characterize the potential threat to the Willamette River. Additionally, the groundwater monitoring wells downgradient of the plume do not appear to monitor the vertical extent of the contamination, and the vertical extent of contamination in soil (and likely groundwater) does not appear to have been delineated.

2.37.3 Retain DEQ as the Lead Agency for River Bank Source Control

Comment Summary

Many comments were received expressing concern that control of the river bank would shift from DEQ to EPA. Those comments are:

- RAO 9 should be removed. EPA violates the scope of the administrative order on consent by including RAO 9 (this should be covered under the remedial investigation/feasibility study work for uplands facilities). There is no data collected for this feasibility study report to provide a basis for analysis of alternatives with respect to river banks. Or baseline risk assessments were not performed for exposure to river bank soil. Or no information in the administrative record to support RAO 9 for river banks.

- Request that EPA honor DEQ's decisions in the source control evaluation process. Actions have already been performed under DEQ oversight. EPA should defer to DEQ and accept their decisions.

- In contrast to its approach to river banks, EPA properly sets no RAO for upland groundwater source control, given that it has determined that upland groundwater source control actions under DEQ oversight are still ongoing. Both river bank and groundwater media are being controlled under DEQ oversight, but EPA has arbitrarily and capriciously decided to treat them differently in the feasibility study and proposed plan. EPA should delete RAO 9 and all evaluations of alternatives based on river bank contamination, and treat river banks in the same way that it is treating upland groundwater.

- EPA is ignoring site-specific work performed under DEQ oversight for river banks. This will undermine DEQ's work and force business that have already passed DEQ's standards to face new and different demands from EPA. Requests that EPA not include river banks or groundwater remediation/remedial cleanup levels within the ROD.

- DEQ is the lead agency with respect to source control actions in Portland Harbor. River bank soils at the Arkema site have already been subject to extensive evaluation, as potentially erodible soils, with respect to COC identification, risk screening, and river bank: source control area identification. In December 2008, LSS submitted to DEQ the river bank: soil source control screening evaluation, which evaluated and identified areas for source control for the Arkema river bank. Comments on this river bank: source control screening evaluation were received from both DEQ and EPA. In 2012, river bank source control alternatives were evaluated as part of the EE/CA report for a removal action and concomitant source control measures (SCMs) at the Arkema site (Integral 2012, Appendix F; Attachment 1). There has been no subsequent correspondence on river bank: SCMs; however, there has been a general agreement with DEQ that the appropriate SCMs for the Arkema site will be conducted under DEQ's supervision, at the same time as or before the in-river remedy for the Site is completed. In keeping with the agencies' 2001 MOU with respect to roles on the Site, EPA must remove the reference to the areas requiring river bank remediation from the proposed plan. Also, in keeping with the method for addressing SCMs for other media (e.g. groundwater and storm water), EPA must reference DEQ plans for addressing upland river bank soils under these source control requirements, such as has been done for the Arkema site. Finally, if there are any data gaps that could affect the assessment of river bank SCMs, these must be clearly identified and addressed by DEQ as the lead agency.

EPA Response

The feasibility study report (USEPA 2016b) presents an evaluation of residual risk under long-term effectiveness as required by the NCP and EPA guidance. River bank soil and sediment pose a risk of recontamination to sediments. Therefore, river bank data provided by DEQ was included in the feasibility study report to facilitate the evaluation of long-term effectiveness.

Additionally, recent remedial actions with on-going performance monitoring were not described in the proposed plan (USEPA 2016c) on a site-by-site basis. Rather, DEQ's upland SCE information was used to identify river banks with known contamination. If performance monitoring concludes that the remedial action met the requirements of the ROD, EPA may not require further action to be taken to address the river bank.

EPA identified RAO 8, Migration of Contaminated Groundwater, for upland groundwater source control. Groundwater and river bank soil are being treated similarly, as described in the ROD. Ongoing source control efforts for groundwater and river bank soil will provide additional risk and recontamination reductions.

Responses for the last two comments are provided in LWG Dispute Issues 1d and 1q (Appendix A of this document).

2.37.4 Ensure Interagency Coordination

Comment Summary

Ten comments were received that requested increased cooperation between agencies (EPA and DEQ) and other entities (the City of Portland, Oregon Health Authority, and Multnomah County Public Health.) to make sure this project will be executed as safely and responsibly as possible. The sense is that this is currently not happening as well as it could. It was believed to be especially important for issues like fish advisories (through close collaboration with the Oregon Health Authority and Multnomah County Public Health) and continuing contaminant sources to the river. Compliance with the City's comprehensive plan and zoning were also mentioned. Issues with DEQ's earthquake safety plans for the tank farms in Linnton/Willbridge were also mentioned.

Representative comments include:

- "It is vital that city, county, state and federal agencies participate and coordinate the cleanup. Communication between agencies is currently not good. Time to learn to work together the way the rest of us do."
- "It is essential that the clean-up plan require a coordinated effort with local and state government, especially regarding effective communication of fish advisories through close collaboration with the Oregon Health Authority and Multnomah County Public Health."
- "Ensure with oversight that the Oregon DEQ has all source controls in place to prevent current and future contamination to the river. Example: The tank farms with 95 percent of all fuel sources are located in Linnton/Willbridge on liquefiable soils at the River edge without adequate earthquake proofing. Unacceptable is DEQ's answer: "We will deal with it when it happens." An earthquake would result in a huge environmental a catastrophe and recontaminate the River."

- "EPA should work together with other government agencies to make sure this project will be executed as safely and responsibly as possible to protect the river for all citizens and wildlife. Please consider the community's input before making a final plan."
- "All local, state and federal authorities should coordinate together on an overall river basin plan to remove pollutant sources and protect the Willamette River for all citizens and wildlife."
- "How are you interfacing with city of PDX and comprehensive plan and how the plan is healing this stretch of our river and increase access to river? Is the zoning compatible with healing the rivers?"
- "I'm concerned that DEQ is not an active partner in cleanup on shores connected with the river."

EPA Response

As described in Section 2.27.1 of this responsiveness summary, shortly after the NPL listing, EPA entered into a 2001 MOU with DEQ, six federal recognized tribes, National Oceanic and Atmospheric Administration, Oregon Department of Fish and Wildlife, and the U.S. Department of Interior. The MOU designated roles and responsibilities for coordination on the cleanup and natural resource restoration of the Site and established a Technical Coordinating Team comprised of MOU partner representatives. The team met at least monthly, frequently twice a month, and was the principle means of coordination and communication of data and information concerning Site management by the respective Lead Agencies, tribes, and Natural Resource Trustees, and to identify and resolve implementation issues. MOU partners worked closely on upland source control activities and the development of the remedial investigation report (USEPA 2016a), feasibility study report (USEPA 2016b), and proposed plan (USEPA 2016c). DEQ and EPA, in particular, have been closely coordinating over the last several years to develop a comprehensive cleanup that covers both the in-river areas and the upland properties. This includes work on the continued evolution of the Joint Source Control Strategy, to ensure the upland and in-river cleanups are coordinated to prevent recontamination of in-river work. DEQ also works with the City of Portland through an Intergovernmental Agreement for the administration of the stormwater program in Portland Harbor.

The Oregon Health Authority, in cooperation with Multnomah County Health Department, is responsible for outreach regarding the fish consumption advisories in effect for Portland Harbor. EPA coordinates its outreach efforts with Oregon Health Authority, DEQ, and the City of Portland to inform vulnerable communities of risks associated with contamination in the river and discuss city/state services that may be available to assist their needs. EPA also includes Tribal communities in its outreach efforts.

DEQ is lead regulator of the ongoing operation of the fuel terminals or "tank farms" adjacent to the Site. According to DEQ's website, each fuel terminal has an emergency plan and coordinates with DEQ's Emergency Response Program, the Portland Fire Department, the U.S. Coast Guard, and the Oregon Emergency Response System. Additional information about DEQ's regulation of fuel terminals can be found at www.deq.state.or.us/aq/northwest/gasTerminal.htm. EPA does not have the authority to change zoning, much of which is designated industrial or commercial along the Portland Harbor reach. EPA is aware of the City of Portland's River Plan. EPA's cleanup process considers reasonably anticipated future land uses in making its decisions and the cleanup will need to comply with federal and state environmental laws regarding minimizing impacts to habitat and compensating for any lost habitat.

2.38 Tribal Comments Received From the Public

2.38.1 Ensure Consultation and A Role in the Process

Comment Summary

Eighteen personal comments were received on this topic. Many of the commenters stated that there was a need to ensure consultation with the tribes in the decision making process and that they believed that consultation to date had been minimal, had not been heeded, and needed to be improved. The second topic was the need for the tribes to play a role (generally oversight) in the cleanup, as they were the people who have been most harmed by the contamination.

Representative comments are:

- "The Yakima nation stands against this and I stand with them. They were not properly included in this process and there is no evidence to support the idea that the plan has been designed or modified to meet their needs."
- "Our native tribes are our river experts so it behooves you to co-operate and listen to them to clean up this Super Fund site QUICKLY AND THOROUGHLY!!!"
- "Tribal consultation appears to have been minimal. Or perhaps EPA has ignored previous comments of First Nations, including The Yakama Nation. We find it appalling that exposure and risk levels remain extremely high for subsistence fishers, and especially for tribal members, even after the so-called "cleanup" is completed. This shows no respect for the rights of tribes to eat fish and continue their cultural practices. This is unacceptable."
- "I urge EPA to make significant revisions to strengthen the plan to reflect public feedback and the detailed responses of Tribal Nations. Tribal consultation has been minimal and weak. The Tribal Nations should be more enthusiastically and thoroughly engaged."
- "I do not believe local tribes have been included fully enough in that plan's formulation. Also not acceptable."
- "Tribal consultation and coordination need to be improved as it is almost none existent now."
- "We strongly believe that EPA should allow Tribal Nations to have an oversight role in the cleanup process."
- "Include the Yakama Nation and all local tribal entities of interest in the proposal. Language regarding the Yakama Nation and all local tribes of interest should be included in the plan, to reflect their role. tribes should be fully engaged and active participants in the Portland Harbor cleanup."
- "Allow Tribal Nations an oversight role in the cleanup process."
- "EPA must partner with tribal governments, urban native organizations, and other representatives of the most impacted communities in crafting an effective ROD that effectively restores the Portland Harbor, protects human health and the environment, and wins community acceptance. EPA's current plan does not do that, and must be abandoned. EPA must recognize that environmental restoration is not a discretionary function -- it a fundamental issue of justice at the heart of EPA's mission. Environmental restoration is necessary for the restoration of the

traditional cultures of the Pacific Northwest, who currently suffer from severe health problems as a result of the disruption of their traditional food sources -- including salmon, lamprey, and Wapato in the Portland Harbor. Finally, EPA must recognize that the customary uses of the Willamette River are protected under the Public Trust doctrine which governs EPA's actions, and which form the bed-rock of all statutory environmental law. In fulfilling these Public Trust duties, EPA is not permitted to behave arbitrarily. It must listen to feedback from the community, and even more importantly, from the Treaty Tribes and urban Native Americans who have a fishing tradition in this region stretching back over 10,000 years."

- "I think the cleanup should actually take its primary direction from those who have been most harmed by the pollution of the river. And that I think first and foremost is the tribes who've relied on it, who have lived here since the time of memorial."

EPA Response

These comments are addressed by responses to formal comments submitted by the tribes. Please see Section 3 of this responsiveness summary.

2.38.2 Respect Treaty Obligations with the Yakama and Others

Comment Summary

A total of 318 postcards were received from the Yakama that read:

- "(The plan) completely ignores EPA's trust responsibility to protect the Yakama Nation's treaty rights. I am counting on EPA to uphold its trust responsibility, to honor our treaty and to deliver a plan that sustains the cultural practices of Yakama members and improves the quality of life for my tribe, our neighbors, and future generations."

Seven other commenters also wrote of the need to honor existing treaty obligations:

- "The Willamette needs to be a safe home for fish and aquatic life that are safe for humans and other animals to consume. It is our treaty obligation, as a country, to clean the Willamette to this standard."
- "We find it disturbing that cleaning up the mess made by industry ignores the fact that fundamental Indian treaties are being ignored. How can you ruin the basic food requirements of the original land owners?"
- "We need to uphold our treaty obligations."
- "We are now standing together to call on EPA to uphold our constitutional civil rights and our fundamental human right to a clean environment. We implore EPA to honor the federal government's treaties with tribal nations. The current proposed plan violates all of the above. This plan violates treaty rights by removing very little contaminated sediment, and by effectively relying on a perpetual health advisory for Portland Harbor fish. This means that fish are unsafe for Tribal members and others to consume, especially women of childbearing age, as well as pregnant women and nursing mothers, whose babies will experience neurological and developmental damage."
- "As you know, the Yakama Nation has said that the current plan would violate their 1855 treaty with the federal government, in particular their fishing treaty rights."

- "Honor the 1855 Treaty with the Yakama Nation. Protect the tribal members' rights to fish in all usual and accustomed places, which includes the Willamette River. Clean up the Willamette River as much as humanly possible so the tribal members, and all others who fish the Willamette River have access to healthy safe fish."
- "And the treaties that have been signed with those tribes prioritized access to traditional foods. And they would never have signed those treaties without that access. And those treaties are in Constitutional law. So that actually supersede CERCLA. So I think EPA needs to really humble itself before the advice and the direction of those tribes. And if they say the cleanup is inadequate, which they have, then it's inadequate. And that needs to be really taken very seriously. And EPA should go back to the drawing board to actually cleaning as much as they're asking. Yakima Nation, as well as a representative from Native American Youth and Adults, Robin White, who was just here, say that this cleanup plan represents a violation of their treaty rights, civil rights, and human rights. And that is a very serious charge. I think EPA needs to actually reflect on that and then come back with a plan that meets their qualifications that actually would provide the diet and the clean food from this river that they are requiring."

EPA Response

These comments are addressed by responses to comments submitted by the tribes. Please see Section 3 of this responsiveness summary.

Section 3

Tribal Comments and Responses

This section presents EPA's responses to written Tribal comments received by EPA during the 90-day public comment period. The comments are presented in this section by entity. The Five Tribes comments are presented first as they are the most comprehensive and responses to comments from individual tribes reference many of the responses prepared for the Five Tribes. The individual tribes are presented in alphabetical order.

Comments and responses are presented as follows:

- Five Tribes
- Confederated Tribes and Bands of the Yakama Nation
- Confederated Tribes of the Grand Ronde
- Confederated Tribes of Siletz Indians
- Confederated Tribes of the Warm Springs Reservation
- Nez Perce Tribe

Consistent with EPA's Policy on Consultation and Coordination and Indian Tribes EPA also held consultation meetings at tribal council locations from January 12 through February 4, 2016 and from July 19 through July 26, 2016, during the public comment period on the feasibility study report (USEPA 2016b) and proposed plan (USEPA 2016c). In addition, representatives for the Confederated Tribes and Bands of the Yakama Nation met with Administrator McCarthy on July 26, 2016 in Washington, D.C. A summary of the consultation meetings, along with any written materials provided, are in the Administrative Record. Responses are contained in this section, or addressed by other comment responses elsewhere in this responsiveness summary.

The consultation process included discussions on treaty rights, in accordance with the February 2016 Guidance for Discussing Tribal Treaty Rights (Treaty Rights Guidance). The Treaty Rights Guidance was issued to provide assistance on consultation regarding EPA actions occurring in a specific geographic area where tribal treaty rights may exist in, or treaty-protected resources may rely on, that area. Responses to all comments received from tribal governments are contained in this section, or addressed by other comment responses elsewhere in this responsiveness summary.

3.1 Five Tribes

3.1.1 Require a Protective, Aggressive, and Large-Scale Remedy

Comment

Achieving a protective remedy within a reasonable timeframe will require an aggressive, large-scale remedy. The remedy should predominantly entail removal of contaminated sediments, rather than leaving the contamination in-place, and include the use of best management practices (BMPs) to minimize short-term impacts (e.g., those described in Sections 2.4.3.1 and 4.2.2.5 of the feasibility

study report and the special cases for NAPL and debris and structure removal noted in Sections 3.4.8.6 and 3.4.8.7, as well as those outlined in FWS and NMFS 2016). Much uncertainty remains about the timeframe for natural recovery. Thus, the remedy should not be overly dependent on natural recovery. Capping contaminated sediments in-place will be a necessary component of the remedy. However, due to the risks and limitations associated with capping, use of this technology should be limited to instances where contamination cannot feasibly be removed and the contamination can be safely contained.

EPA Response

Refer to Sections 2.6.1, 2.12.2, 2.13.1, 2.16.1, 2.19.1, and 2.34.1 of this responsiveness summary.

3.1.2 Establish a Timeframe in Which to Meet RAOs

Comment

A timeframe must be established by which to meet all RAOs and associated acceptable risk levels (i.e., PRGs). Although the Five Tribes advocate for a remedy that will achieve cleanup goals as quickly as possible, we acknowledge that natural recovery is a necessary part of the remedy. The selected remedy should have a very high likelihood of achieving cleanup goals within 10 years following construction. After decades of contamination, we should not have to wait any longer than absolutely necessary for a clean river. The uncertainty of natural recovery processes at the Site further underscores the importance of selecting a remedy that does not rely on a lengthy (i.e., more than 10-year) recovery period following construction.

EPA Response

See Section 2.24, 2.17.1, 2.21, and 4.1.1 of this responsiveness summary.

3.1.3 Use MNR and ENR Judiciously

Comment

We acknowledge that, for practical purposes, the remedy will need to rely in part MNR, ENR, and sediment capping. However, these technologies should be used judiciously. The hydrodynamics of the Willamette River are complex, and even areas that are primarily depositional also erode. The inability of EPA and LWG to develop a hydrodynamic and sediment transport model that accurately predicts deposition and erosion highlights this complexity. Because tools are not available to accurately predict deposition and erosion on a fine spatial scale, we cannot assert the degree to which natural recovery processes will occur. Thus, EPA must use the environmentally protective assumption that natural recovery will be limited. MNR and ENR must not be used in erosional areas and must only be used in areas of low contamination. MNR should be used only in depositional environments.

EPA Response

EPA will update the data through focused remedial design sampling activities at the Site. Remedial design sampling data will be used to apply the decision tree in the ROD and to refine the footprint of areas that will be targeted for capping, enhanced natural recovery, and in-situ treatment and to refine the volume of material that will be targeted for removal through dredging and excavation. In addition, long-term monitoring will be performed to monitor the effectiveness of the remedy to achieve the remedial action objectives established for the Site. See also Sections 2.16 and 2.19.

3.1.4 Recognize Issues with Capping

Comment

Capping contaminated sediments in-place can be a practical, even necessary solution in certain circumstances. Sediment caps, however, come with risks, costs, and limitations. The dynamic nature of the Willamette River presents challenges in designing and maintaining a permanent cap. Bathymetric surveys and other data collected over a ten-year period or less may not be indicative of river conditions in the long term. Further, the effectiveness of even comprehensive monitoring has its limitations: breaches in cap integrity may not be immediately detected and may re-contaminate the area. With climate change, large-scale climatic events, a Cascadia Subduction Zone event, and other uncertainties, there is a very real possibility that leaving contamination in place will result in re-releases over long timescales, such as 100 years or more, to the detriment of future generations.

EPA Response

Refer to Section 2.13.1 of this responsiveness summary.

3.1.5 Explain Long-Term Management of Sediment Caps

Comment

EPA will update the data through focused remedial design sampling activities at the Site. Remedial design sampling data will be used to apply the decision tree in the ROD and to refine the footprint of areas that will be targeted for capping, enhanced natural recovery, and in-situ treatment and to refine the volume of material that will be targeted for removal through dredging and excavation. In addition, long-term monitoring will be performed to monitor the effectiveness of the remedy to achieve the remedial action objectives established for the Site. The Five Tribes are concerned with any entity's ability to manage a cap in perpetuity. Indeed, EPA has only been in existence for 45 years. Thus, there are no examples of EPA successfully managing sediment caps for long timescales. We are concerned with whether the relevant entities (the responsible parties and EPA) will even exist 100 years from now, and whether funding and political willpower will be available for monitoring and maintenance.

EPA Response

Refer to Sections 2.17 and 2.19 of this responsiveness summary.

3.1.6 Do Not Let Convenience and Cost Savings Bias Use of Caps

Comment

We are also concerned about the restrictions on river use that would result from capping significant portions of the Site. Capping would permanently restrict future development in the river, including placement of structures and dredging. The upcoming remedy is EPA's chance to clean up the river – likely its only chance – for the use of future generations. EPA should therefore focus on developing a remedy not only that will protect human health and the environment but that will not significantly limit uses of the river in the future. We strongly urge EPA to adopt a remedy that does not rely on capping for mere convenience and cost savings, but rather is focused on removing the contaminated material wherever practicable.

EPA Response

Capping will only occur consistent with future land uses, and will not restrict the tribes' ability to fish or collect shellfish, for example. Refer to Sections 2.13 and 4.1.5 of this responsiveness summary.

3.1.7 Limit the Need for ICs

Comment

An aggressive, removal-focused remedy is desirable because it will limit the need for MNR and ICs, both until PRGs are achieved and in perpetuity. In addition to the uncertainties associated with the success of MNR and the potentially lengthy time period required to achieve PRGs, MNR requires "significant administrative effort over the long term to oversee and coordinate sampling, data evaluation, and future additional actions, if any are needed" (USEPA 2016b, p. 4-40). Thus, MNR may be an easier solution than removal in the short term but requires significant effort in the long term. EPA also acknowledges that ICs are of limited effectiveness. For instance, EPA states that fish consumption advisories "are not enforceable and are generally understood to have limited effectiveness," should "be relied upon to the minimum extent practicable," and do not protect the ecological receptors themselves (USEPA 2016b, p. 4-12 and 4-88). Land use restrictions are also of limited effectiveness, as they "are difficult to monitor in a river environment" (USEPA 2016b, p. 4-12).

EPA Response

Refer to Sections 2.28.3, 2.31, 4.1.1, and 4.1.2 of this responsiveness summary.

3.1.8 Do Not Leave PTW that Cannot Be Reliably Contained

Comment

No NAPL or PTW that cannot be reliably contained (NRC PTW) should be left in the river, as these materials can migrate and act as a source of ongoing contamination. The Five Tribes are not in favor of capping these materials, no matter how engineered the cap is. These materials may migrate horizontally, either now or in the future when environmental conditions, such as hydrology, change. Any structures impeding dredging of these materials should be seriously evaluated for the feasibility of removal. In addition, NAPL and NRC PTW at depth should be dredged using all available means. These materials should only be capped if under a structure that cannot be removed or if located too deep for best available technology to reach.

EPA Response

See Sections 2.5, 2.13, and 2.21 of this responsiveness summary.

3.1.9 Do Not Increase PRG Values in the ROD

Comment

We understand that EPA has the ability to change PRGs as they become final cleanup levels in the ROD. The PRGs are generally based on sound science and ARARs, and we strongly urge EPA not to increase these values in the ROD. Certain parties, such as LWG, have questioned the validity of the polycyclic aromatic hydrocarbon (PAH) PRGs, specifically. We support the existing PAH PRGs, which are based on Site-specific risk calculations.

EPA Response

PRGs developed for the proposed plan (USEPA 2016c) are now updated as appropriate and included in the ROD as final cleanup levels. Based on future data collection, EPA will evaluate issues of technical impracticability in achieving these levels on a case by case basis. Also refer to Section 2.3 of this responsiveness summary.

3.1.10 Do Not Issue ARAR Waivers

Comment

We acknowledge that it is possible that certain cleanup goals based on background concentrations may never be met at the Site due to inputs from outside Site boundaries (e.g., upstream, upland). The Five Tribes do not support the issuance of an ARAR waiver (e.g., based on technical impracticability) at this time, and believe that EPA is making appropriate steps to issue a ROD without such a waiver. Technical impracticability waivers do not adequately protect treaty-protected rights and resources. (Treaty-protected rights and resources, while not explicitly referenced in the remainder of this document, are relevant to any discussion of the adequacy of the cleanup.) EPA should adopt a remedy that is likely to achieve cleanup goals. After remedy construction, progress toward cleanup goals should be monitored periodically, and the success of the remedy should be evaluated during five-year reviews. If the Site is not on target to achieve cleanup goals, the need for additional remediation (through a ROD amendment) should be seriously considered, in consultation with MOU partners. A decision to issue a waiver would require: (a) a robust, long-term monitoring dataset (covering the period from construction completion through at least 10 years post-construction) that indicates that certain COC concentrations in specific media remain at steady-state concentrations above PRGs, and (b) a determination based on thorough analysis that additional active cleanup and/or additional source control cannot be undertaken. The Five Tribes expect to be full participants in any evaluations or decisions related to consideration of technical impracticability or other ARAR waivers.

EPA Response

EPA agrees that there is insufficient information at this time to waive any ARAR and have not done so in the ROD. Please see Section 2.3.1 of this responsiveness summary.

3.1.11 Address Community Concerns Through BMPs and Monitoring

Comment

The Five Tribes are hopeful that community concerns about construction impacts can be addressed through BMPs and monitoring. The cleanup of this important resource, a cleanup that will benefit countless future generations, should not be compromised for the sake of immediate convenience (i.e., avoiding short-term construction impacts). Anticipated construction impacts are myriad and include potential air quality impacts, increased vehicular and vessel traffic, noise, odor, and lights. EPA should work with local communities to try to address their concerns to the extent possible while still achieving stringent cleanup objectives in a timely manner. BMPs should be used to control these impacts (Section 4.2.2.5 of the feasibility study report), and monitoring for impacts to human health should be rigorously conducted, with adaptive management employed if monitoring indicates unacceptable human health risks.

EPA Response

Refer LSS Dispute Issue 16 (Appendix A of this document) and Sections 2.8, 2.14.3, 2.20, and 2.21 of this responsiveness summary.

3.1.12 Select a Version of Alternative G

Comment

Based on the priorities described above and a technical evaluation of the proposed plan and feasibility study, the Five Tribes support a version of Alternative G (with modifications noted herein). Primarily, we support the use of Alternative G RALs, but request specific changes to the technology assignment methodology and technology applications.

Although we support elements of Alternative I, the alternative relies too heavily on uncertain natural recovery processes and leaves too much contamination in the river, posing human health and environmental risks in both the short and long term. By EPA's own interim target analysis, Alternative I is not expected to achieve cleanup goals within a reasonable timeframe and is therefore not protective of human health or the environment. As described below and by EPA's own evaluation of the evaluated alternatives, only Alternative G meets the two threshold criteria of "Overall Protection of Human Health and the Environment" and "Compliance with ARARs." Therefore, the greater cost and construction duration (which contribute to the evaluation of balancing criteria) of Alternative G compared to other alternatives should not be the basis for rejecting Alternative G. Of the alternatives that EPA carries forward to detailed analysis, EPA must select Alternative G.

EPA Response

As stated Section 4.3 and shown in Table 4.3-3 of the feasibility study report (USEPA 2016b), Alternatives E, F, G and I all meet the two threshold criteria of Overall Protection of Human Health and the Environment and Compliance with ARARs. While Alternative G may have the most reduced long-term risks, the feasibility study selected Alternative I in part due to its superior ability to minimize short-term disruption and risks. The selected alternative, Alternative F Modified reduces long-term human health risks more quickly than Alternative I and minimizes reliance on ICs. Refer to Sections 2.6 and 2.31 of this responsiveness summary.

In assessing the various Alternatives EPA also looked at the Willamette River watershed as a whole, to determine the feasibility of providing a cleanup response that would effectively improve water quality to the level that is protective of ecological receptors and human consumers of fish and shellfish. The cleanup in this action is restricted to approximately a 10-mile segment of the Willamette River and upstream contamination from past and current permitted industry is not being addressed at this point. These facts further supported EPA's decision to pursue Alternative F Modified, rather than any other proposed remedies.

3.1.13 Use PRGs as Cleanup Levels in ROD

Comment

We support the PRGs and advocate for their use as cleanup levels in the ROD.

EPA Response

Comment noted. EPA did not change any of the PRGs from the proposed plan (USEPA 2016c), and they are the final cleanup levels in the ROD.

3.1.14 Retain EPA's Definition of PTW for the Site

Comment

We support EPA's definition of PTW for the Site. PTW should be defined, in part, based on calculated risk. PTW defined by higher contaminant concentrations at other sites is not relevant to EPA's definition of PTW at this Site.

EPA Response

Comment noted. See Section 2.5 of this responsiveness summary.

3.1.15 Include River Banks in Remedy

Comment

We support EPA's inclusion of river banks in the remedy. Including river banks gives EPA authority to direct cleanup work (in the form of excavation and capping) to prevent recontamination of the Site. Although the DEQ has historically had jurisdiction over river bank cleanup along the Site, the addition of river banks to the remedy prevents any disconnects between EPA and DEQ's work, such as delays in river bank cleanup beyond the Site cleanup. EPA is not ignoring or undermining any of DEQ's upland efforts by doing so, and we understand that additional data (e.g., remedial design or post-construction monitoring data) may show that certain river banks and groundwater plumes originally slated for remediation under the Site-wide cleanup may no longer need active cleanup. We urge EPA and DEQ to continue to work closely to ensure that cleanup under the remedy does not unnecessarily conflict with past or ongoing river bank work or create an unnecessary burden for the responsible parties.

EPA Response

Comment noted. The ROD includes river banks as proposed in the proposed plan (USEPA 2016c).

3.1.16 Use BHRRA Fish Consumption Rates

Comment

We support the fish consumption rates used in the BHRRA (Kennedy/Jenks 2013) and carried forward to the feasibility study. Consumption rates in Oregon are typically higher than elsewhere in the country, including for tribal fishers (FWQC 2013; CRITFC 1994). The rates used in the BHHRA accurately reflect this reality

EPA Response

Comment noted.

3.1.17 Reject LWG's Hydrodynamic and Sediment Transport Model

Comment

We support EPA's rejection of LWG's hydrodynamic and sediment transport model. As outlined in Appendix H of the feasibility study report, the model over-predicted the amount of deposition occurring within the Site, which in turn overstates the potential success of MNR (USEPA 2016b). The model failed to properly link the sediment transport model with the hydrodynamic model. It also did not sufficiently address the effects of wind- and wake-generated erosion, which are likely to be significant for the Site, and did not address bedload transport.

EPA Response

Comment noted.

3.1.18 Use the Current Portland Harbor Dataset

Comment

We support EPA's use of the current Portland Harbor dataset for the purposes of the feasibility study and proposed plan, which includes data from 1997 through 2011. Although data are not strictly recent, collecting additional data to update the database at this time would only serve to delay progress in implementing a remedy. New baseline data must be collected for remedial design and will serve a similar purpose to data that would be collected now.

EPA Response
Comment noted.

3.1.19 Reject Alternatives B and D as They Are Not Sufficiently Protective

Comment
We support EPA's determination that Alternatives B and D are not sufficiently protective of human health or the environment (e.g., EPA 2016a, p. 50).

EPA Response
Comment noted.

3.1.20 Use BMPs as Needed

Comment
We are generally supportive of the BMPs that EPA proposes to minimize impacts to local communities and the environment.

EPA Response
Comment noted.

3.1.21 Use A Cover Layer to Control Residuals After Dredging

Comment
We support the placement of a thin layer cover immediately following dredging in order to control residuals.

EPA Response
Comment noted.

3.1.22 Explain How Alternative I Meets the Protectiveness Criterion

Comment
According to Superfund regulations (40 CFR 300.430) and guidance (e.g., EPA 1988, 1990), EPA must evaluate alternatives against two threshold criteria, as well as five balancing criteria. Typically, the two threshold criteria must be met in order for an alternative to be selected. The two threshold criteria are "Overall Protection of Human Health and the Environment" and "Compliance with ARARs." In the feasibility study, EPA evaluates the first of these threshold criteria based on whether each alternative meets "interim targets" for each RAO. Interim targets are goals set for the time period immediately following construction completion. If an alternative is expected to meet interim targets post-construction, the alternative is assumed to meet cleanup goals within a reasonable timeframe. For this Site, EPA defines a reasonable timeframe to be 30 years (measured from the start of construction). EPA's comparison of alternatives to interim targets concludes that Alternative I only meets two out of the five measurable interim targets. Based on EPA's own definition of interim targets, Alternative I is therefore not expected to meet cleanup goals within 30 years and thus does not meet the "Overall Protection of Human Health and the Environment" criterion. EPA errs when it concludes that Alternative I meets this criterion. Of the alternatives evaluated, only Alternative G meets all measurable interim targets.

EPA Response

EPA has revised its preferred alternative to Alternative F Modified. Alternative F Modified relies on application of the same remedial action levels (F RALs) throughout the Site with the exception of the navigation channel where the remedy will target PTW and sediment contamination exceeding the Alternative B RALs. The modifications for the navigation channel are appropriate because the risk exposures and physical conditions in the channel are different from the rest of the Site. The levels of contamination in the navigation channel are lower than in nearshore and intermediate areas of the River. Exposure to contaminants in the channel is limited since the depth of the channel is greater than 30 feet and based on information gathered during the remedial investigation, the understanding is that most of the fish species feed in the shallower areas of the Site. Refer Sections 2.6, 2.7, and 3.2.5.

3.1.23 Explain Why Alternative G Was Rejected as It Is the Only Alternative to Meet ARARs

Comment

EPA determined that all alternatives except Alternative B meet the second threshold criterion, "Compliance with ARARs." Given that many PRGs are based on chemical-specific ARARs, if the interim target analysis determines that an alternative will not meet PRGs within a reasonable timeframe, it logically follows that the alternative also does not comply with ARARs. Therefore, based on the above comment, the only alternative that complies with ARARs is Alternative G. Thus, Alternative G is the only alternative that meets the two threshold criteria and is the only defensible alternative. The higher cost and greater construction impacts of Alternative G compared to other alternatives should not be a reason for rejecting Alternative G.

EPA Response

As stated in Section 4.2.2.2 of the feasibility study report (USEPA 2016b), Alternative B would be unlikely to meet chemical-specific ARARs in a reasonable timeframe. However, all other alternatives would meet chemical-specific (and all other) ARARs because of the reduced reliance on MNR. See Sections 2.1, 2.3, 2.6, and 2.31 of this responsiveness summary.

3.1.24 Defer to the Most EnvironmentallyProtective Alternative

Comment

We acknowledge that EPA's ability to determine whether and when alternatives will meet cleanup goals in the absence of an accurate natural recovery model is very limited. We appreciate EPA's attempt to evaluate the ability to meet PRGs based on the interim target concept, which sets targets for cleanup post-construction, a point at which it is easier to predict sediment concentrations because an understanding of natural recovery is not required. We are concerned, however, about the selected interim targets. EPA does not justify why meeting these particular interim targets post-construction ensures that the alternative will meet cleanup goals after 30 years. The selection of the RAO-specific interim targets appears random and not rooted in science. Thus, we do not have confidence in this approach. Lacking a better approach, EPA must defer to the most environmentally protective option, Alternative G. Coincidentally, a strict application of EPA's interim target approach also supports the conclusion that Alternative G is the only defensible alternative, as explained above.

EPA Response

Interim targets were developed using a model called SEDCAM. The SEDCAM model outputs are a single line of evidence among several other lines of evidence (bathymetry, percent fines, propeller wash areas, wind/wake conditions, and subsurface to surface sediment concentration ratios) used to

forecast the achievement of interim targets, all with high degrees of uncertainty in a dynamic and complex river system. Given this uncertainty, EPA will focus greatly on the development of a robust monitoring plan following the ROD to evaluate progress towards cleanup levels with empirical data. The SEDCAM modeling results show that the selected remedy, Alternative F Modified, is protective within a reasonable timeframe given the uncertainty in the model.

3.1.25 Let Long-Term Protection Drive the Decision Process

Comment

Aside from our assertion that Alternative G is the only alternative carried forward for full evaluation that meets the two threshold criteria, the substantial reductions in risk afforded by Alternative G further justify the selection of this alternative. The figures and tables in Section 4.2 of the feasibility study report illustrate these reductions. The Alternative G risk reductions are especially apparent when the data in Section 4.2 tables are graphed (Attachment 1). Although we advocate for Alternative G, we note that there are also substantial risk reductions between Alternatives E/I and F, highlighting the superiority of Alternative F over Alternatives E and I. EPA's decision to select Alternative I over alternatives that have clear risk reduction benefits is based on a value judgment of the relative importance of short-term construction impacts and cost compared to long-term protection of human health and the environment. The Five Tribes strongly believe that long-term protection of human health and the environment should drive the remedy decision; Alternative G is therefore the best alternative of those evaluated by EPA.

EPA Response

Evaluation of alternatives under CERCLA includes an evaluation of both short and long-term impacts of the remedy. These impacts are further explored under the Clean Water Act 404 analysis attached to the feasibility study report (USEPA 2016b). Through this analysis it was apparent that construction of a cleanup taking decades longer than the selected Alternative F Modified would result in unacceptable benthic impacts over an extended duration of time. Rather than a "value judgement," this finding is an appreciation of the real temporal impacts from such aggressive, extended duration cleanup alternatives that outweighed the incremental longer term gains of such alternatives. Also refer to Sections 2.1, 2.3, 2.6, and 2.31 of this responsiveness summary.

3.1.26 Consider Alternative G Which Meets the Protection Goal in 10 Years

Comment

As noted in the Pathway for Achieving Vision section above, we support a remedy that is expected to achieve protection within 10 years following construction, not 30 years from the start of construction. According to EPA, Alternative G would achieve protection in 11 years following construction (i.e., the remedy would be protective 30 years following the start of construction, with a 19-year construction duration). Thus, Alternative G nearly meets our objective of achieving protection within 10 years following construction. According to EPA's analyses, the other alternatives do not.

EPA Response

For the SDUs where active remediation through capping and dredging takes place, sediment concentrations will approach the remedial cleanup levels immediately following construction (approximately 13 years). In the remainder of the Site, MNR is expected to reduce sediment concentrations to the remedial cleanup level within approximately 30 years to be confirmed in post-construction monitoring.

3.1.27 Do Not Choose a Middle Ground Remedy by Default

Comment

Table 15 of the proposed plan attempts to compare the performance of each alternative against the two threshold criteria and five balancing criteria. For this exercise, a qualitative approach is used to rank alternatives from "least" (worst) to "best" for the five balancing criteria. Alternatives are ranked progressively "better" or "worse" (with the exception of "Short-Term Effectiveness"; see comment below). For instance, for the "Long-Term Effectiveness and Permanence" criterion, G is ranked better than F, which is better than E, which is better than D, which is better than B. With the exception of I, which is always ranked the same as E, no two alternatives receive the same ranking. This approach leads to a bias toward selecting the remedy in the middle (E and I are in the middle of the other alternatives) because EPA is trying to "balance" the "Short-Term Effectiveness," "Implementability," and "Cost," all of which get "worse" with increasingly aggressive remedies, against "Long-Term Effectiveness and Permanence" and "Reduction of Toxicity, Mobility, or Volume through Treatment," which get "better" with increasingly aggressive remedies. EPA should not base its decision on a system that by default selects the middle remedy. The middle remedy is not by definition the best remedy.

EPA Response

EPA has sought to provide a balance of achieving the most reduction in risk to people and aquatic organisms through a protective cleanup while reducing short-term and overall impacts to the environment, the community, and workers during and after construction. Per EPA guidance, short and long-term risks were not looked at as tradeoffs, but rather as part of a holistic view of alternative evaluation. While Alternative G may have the most reduced long-term risks, the proposed plan (USEPA 2016c) selected Alternative I in part due to its superior ability to minimize short-term disruption and risks. The selected alternative in the ROD, Alternative F Modified reduces long-term human health risks more quickly than Alternative I and minimizes reliance on ICs.

3.1.28 Rescore the Short-Term Effectiveness Criterion

Comment

EPA notes that the "Short-Term Effectiveness" balancing criterion includes both the short-term environmental and community impacts during construction and also the environmental and human health impacts of the Site until RAOs and PRGs are attained (USEPA 2016b, p. 4-13). Both of these components of the criterion are discussed in the detailed analysis of alternatives (USEPA 2016b, Section 4.2). However, the scoring in Table 4.3-3 of the feasibility study report appears to consider primarily the short-term impacts during construction, an approach that favors the less aggressive alternatives (e.g., Alternative G was scored worst). Though we agree that the construction impacts during the four-month in-river work window of each year would be greatest under Alternative G, this alternative would achieve cleanup levels the fastest and would therefore present the least human health and environmental risks in the short term. This is an important point because, as indicated in the comment above, EPA appears to arrive at Alternative I by weighing the two balancing criteria that favor more aggressive cleanups against the three that currently favor less aggressive remedies. If the "Short-Term Effectiveness" criterion is re-scored as we propose here, the evaluation would correctly tilt toward a more aggressive cleanup.

Presumably, EPA's "moderate" (rather than "best") ranking of Alternative B accounts for the fact that this alternative would have the fewest construction impacts but the greatest impacts post-construction. However, the ranking of the other alternatives does not appear to penalize alternatives for impacts post-construction. We also disagree with the designation of Alternatives E and I as

"better", while Alternative F receives a "low" rank. Even if EPA is scoring these alternatives based only on construction impacts, we do not believe that the moderate increase in construction time and footprint between Alternatives E/I and F justifies this large jump.

EPA Response

Refer to Section 2.20 of this responsiveness summary.

3.1.29 Give Less Weight to Benthic Impacts During Construction

Comment

EPA appears to justify selecting Alternative I over Alternative G in part because the latter alternative "impacts [benthic] habitat for the longest period of time during construction (19 years) and would take the longest time for benthic populations to recover due to the large area of habitat impacted (776 acres)" (USEPA 2016a, p. 60). While dredging and capping do disturb benthic habitat during the duration of the disturbance, benthic organisms tend to recolonize within a period of several years following the end of disturbance (e.g., Wallace 1990; Lamberti et al. 1991). The duration of disturbance of any given area of benthic habitat would depend on how work is sequenced. If, for instance, remediation is conducted from upstream to downstream, the remediated areas would have the opportunity to recolonize as equipment moves downstream. In that case, the duration of impact of any given area would be expected to be significantly less than 19 years.

Further, EPA frequently refers to the greater impact to the environment and benthic community of Alternatives F and G compared to Alternatives E and I (e.g., EPA 2016a, p. 66; EPA 2016b, p. 4-98 and p. 4-100). While we assume that EPA intends to refer to short-term construction impacts only, the language as written is misleading. Overall, Alternatives F and G will have a more positive impact on the environment and benthic community due to greater risk reduction following construction and a shorter time to achieve cleanup goals.

EPA Response

EPA agrees that disturbance of benthic populations would depend in part on sequencing, and that benthic populations can recover relatively quickly. Mitigation measures and best management practices will be implemented to minimize impacts on benthic populations to the extent possible, and remedial implementation planning would consider sequencing, timing, and other factors. Impacts on benthic populations are just one of the short-term effects that were considered in the alternative evaluation.

EPA has selected its preferred alternative to Alternative F Modified as its final remedy, which will achieve risk reduction in a shorter time compared to Alternative I, and relies less on MNR. See also Sections 2.1, 2.6, 2.31, and 2.34 of this responsiveness summary.

3.1.30 Consider Alternative F or G Based on Greater Risk Reduction

Comment

In relation to removing contaminated sediment and river bank soil and transporting it through local communities, EPA argues that "Alternatives F and G would impose significantly greater impacts to the environment and community and have much greater costs (1.5-2 times more than Alternatives E and I) that are not commensurate with the additional risk reduction relative to Alternatives E and I" (USEPA 2016a, p. 60; USEPA 2016b, p. 4-99). Although Alternatives F and G may have greater short-term impacts and costs compared to Alternatives E and I, EPA does not sufficiently justify that these

impacts are not commensurate with the additional risk reduction. We believe that the greater risk reduction does justify the additional construction impacts and costs of Alternatives F and G.

EPA Response

EPA has selected Alternative F Modified for its final remedy. See also Sections 2.1, 2.6, 2.31, and 2.34 of this responsiveness summary.

3.1.31 Address Issues with Presentation of NAPL and PTW Areas

Comment

The feasibility study also does not clearly present the amount of NAPL and NRC PTW material that is expected to remain in place by alternative. This information is distinctly different from the amount of PTW addressed by each alternative (e.g., EPA 2016b, Table 4.2-9), and is not easily determined through the use of existing tables and information. We ask EPA to clearly present this information.

EPA Response

Refer to Sections 2.5, 2.10, and 2.14 of this responsiveness summary. EPA did not establish any boundaries of waste in the 2016 feasibility study report (USEPA 2016b). EPA developed estimates of various types of waste based on existing information to estimate costs in the feasibility study. The figures show the extent of the evaluation based on various assumptions identified in the feasibility study report. The extent of the RAL boundaries and cap designs will be established in remedial design. EPA agrees that additional data collection during remedial design will be required to determine the appropriate design and waste treatment and disposition requirements.

EPA used a robust data set provided by LWG, including sediment data collected as recently as 2013 and fish tissue data collected as recently as 2012, to develop the alternatives in the 2016 feasibility study report. The data set includes 2,259 surface and 975 subsurface sediment samples collected during the remedial investigation and various early action efforts to characterize the nature and extent of contamination. EPA does not believe there are any errors or omissions in the CSM and that the information used in the 2016 feasibility study report is sufficient to develop and select a remedial alternative. However, EPA acknowledges that additional data will be collected during remedial design. These data will be used to support establishing remedial action footprints, technology assignments, use restrictions or other ICs, treatment and disposal of dredged material, mitigation requirements, among others.

3.1.32 Expand SMAs

Comment

The Five Tribes appreciate the addition of the GeoPDF to EPA's Portland Harbor Superfund website, which allows users to overlay various data layers presented in the feasibility study, such as sediment contaminant concentrations and technology assignments for each alternative. The GeoPDF begins to address the concern we have expressed previously regarding our inability to readily determine whether non-focused COCs are adequately addressed by the proposed remedy. Because high concentrations of focused COCs (i.e., COCs for which RALs are developed, including PCBs, DDx, total PAHs, PeCDF, PeCDD, and TCDD) and non-focused COCs are generally co-located, areas designated for active remediation (i.e., sediment management areas, or SMAs) based on focused COC concentrations also tend to address areas of high concentrations of non-focused COCs. However, there are a few areas where this is not the case. For example, high concentrations of arsenic in surface sediment exist on the east side of the McCormick & Baxter cap, but this area is not assigned any active remediation under

Alternative I. In contrast, Alternative G would require dredging with a cap in this area. Similarly, high concentrations of chromium and copper in surface sediments (and copper in subsurface sediments) are located at the north end of the RM 6.5E SDU, an area that is assigned MNR under Alternative I. Alternative G would require capping and dredging of this area. These observations support our preference for selecting Alternative G as the preferred alternative. If EPA selects a remedy less protective than Alternative G, we request that EPA expand SMAs to address areas exhibiting high concentrations of non-focused COCs, such as the examples we have described.

In addition to the examples described above, we note several areas of relatively high non-focused COC concentrations that fall outside SDUs and are therefore assigned MNR for all alternatives. For instance, high concentrations of several contaminants (e.g., bis(2-ethylhexyl) phthalate in surface sediment) exist in the east-most portion of Swan Island Lagoon. However, this area is not included in the Swan Island SDU. In addition, high concentrations of TBT in subsurface sediments between the RM 6.5E SDU and Swan Island Lagoon (between RM 7 and 8) fall outside of any SDU. We request that EPA expand SDUs to include these areas, as well as other areas with high concentrations of non-focused COCs.

Our above analysis is based on areas of relatively high non-focused COC concentrations. We recommend that the contaminant intervals be expressed as multiples of the PRG or that EPA include a risk-based threshold in the legend for each of the COCs (most likely, the corresponding PRG) to enable a more meaningful evaluation of COC concentrations.

EPA Response

EPA has selected Alternative F with modifications as the final remedy. See Sections 2.1, 2.3, 2.6, and 2.31 of this responsiveness summary.

3.1.33 Limit Use of MNR – Especially in RM 6NAV SDU

Comment

EPA assumes that MNR will be applied to all areas within the Site boundary that are not otherwise actively remediated. The Five Tribes assert that MNR will only be effective in areas that are predominantly depositional, not erosional. EPA's analysis of the natural recovery potential of each SDU indicates that all but two SDUs are considered "neutral," that is, neither consistently depositional nor erosional (USEPA 2016b, Section 3.6.1.2). The other two SDUs (RM 6NAV and RM 11E) are erosional. The results of this analysis do not provide confidence that natural recovery will be effective in any of the SDUs. Further, it is clear from many of the figures in the Figure D8 series of Appendix D of the feasibility study report that most SDUs contain at least some erosional areas. The summary analysis (compilation of results across all relevant data types) is conducted on SDUs only (USEPA 2016b, Table D8-3), so the natural recovery potential for areas outside the SDUs must be visually evaluated based on Figures D8-1 through D8-7. However, the areas outside of SDUs seem to have similarly mixed results.

We are particularly concerned about the RM 6NAV SDU, which EPA acknowledges is not conducive to natural recovery but which is primarily slated for MNR under Alternative I. We understand that any area in this SDU that is not dredged under the remedy may be navigationally dredged (because it is in the navigation channel), which may remove material whose concentrations are above PRGs but below RALs. However, we are not convinced that navigational dredging will occur in a timeframe relevant to our requested recovery period of 10 years post-construction. We urge EPA to assign ENR to any area within this SDU that is not otherwise actively remediated if navigational dredging is not expected to occur within a period of 10 years post-construction, and if the navigational dredging is not expected to

be implemented throughout the entire MNR area of the SDU. Further, although a significantly lower percentage of RM 11E is slated for MNR under Alternative I compared to RM 6NAV, ENR, rather than MNR, should be assigned to any areas in this SDU not assigned to dredging or capping because this SDU is also erosional, and is not primarily in the navigation channel.

Therefore, EPA's finding that the entire river is at best neutral with regard to the potential for natural recovery highlights the need to select a remedy that is focused on active remediation and minimizes reliance on natural recovery.

EPA Response

EPA recognizes the uncertainty associated with MNR, and that no model can predict with certainty how MNR will work in a dynamic and complex river system. Therefore, EPA chose to reduce reliance on MNR in the interest of reducing risks with technologies that are certain to work and in a shorter timeframe, and to focus greatly on the development of a robust monitoring plan following the ROD to evaluate achievement of cleanup levels with empirical data. The SEDCAM modeling results show that the selected remedy, Alternative F Modified, is protective within a reasonable timeframe given the model uncertainty. See also Sections 2.16, 2.31, 3.1.2, and 3.1.27 of this responsiveness summary.

3.1.34 Select Removal Over Capping where Feasible

Comment

As stated previously, we urge EPA to select removal over capping whenever feasible, and especially when NAPL or NRC PTW is present. We are skeptical about the effectiveness of EPA's proposed significantly augmented reactive caps in containing these materials. At which sites has this technique been used to successfully contain these materials? For instance, the feasibility study report references the use of an organoclay reactive cap at the McCormick and Baxter cap but does not discuss the success of this cap (USEPA 2016b, p. 3-5). EPA indicates that reactive caps may not be effective when multiple contaminants (e.g., metals and organics) are present (EPA 2016b, Table 2.4-2). How does EPA plan to assess and manage this issue? We also point out that reactive caps need to be periodically replaced, as their sorptive or chemically reactive treatment capabilities degrade over time (USEPA 2016b, Table 2.4-2). We are concerned about the environmental impacts of replacing a cap over NAPL or NRC PTW. These concerns underscore the importance of removing NAPL or NRC PTW by all available means. We also point out that EPA describes the use of activated carbon for in-situ treatment as "permanent and irreversible as long as there is sufficient quantity of activated carbon to address the amount of contamination present" (USEPA 2016b, p. 4-33). Based on Table 2.4-2, it appears that EPA expects that activated carbon will need to be periodically replaced. EPA should clarify its expectation regarding the permanence of activated carbon and the need to replace it over time.

EPA Response

Refer to Sections 2.5, 2.6, 2.13, 2.16, and 2.19 of this responsiveness summary.

3.1.35 Explore Removing Wharfs and Shore-Based Facilities

Comment

EPA assumes that structures servicing active wharfs or shore-based facilities will remain intact during remedial activities (e.g., EPA 2016a, p. 36; EPA 2016b, p. 3-10). In contrast, we contend that EPA should seriously explore removing all such structures in active remediation areas to the extent practicable, particularly if they impede the removal of NRC PTW or NAPL. Perhaps there are major active structures whose removal is not possible. However, it may be feasible to remove minor active

structures to allow for the dredging of highly contaminated material from the Willamette River and to avoid capping such material.

EPA Response

EPA agrees that maintaining flexibility in construction through the remedial design phase is an important consideration, particularly for nearshore areas near structures as well as area with debris. Decision matrices in the feasibility study report (USEPA 2016b) were developed as a method to guide the assignment of capping and dredging technologies, based on specific site characteristics within SMAs to evaluate the alternatives on consistent and transparent assumptions. A more flexible decision tree is included in the ROD and will be used during remedial design to define what actions should be taken in different areas of the Site based on the most recent design data. Once the data and river factors are evaluated within the context of the decision tree, a final design for construction can be completed. This design will then dictate the remedial construction. The decision tree is intended to provide clear direction on what actions should be taken under the different environmental conditions. See also Section 2.21 of this responsiveness summary.

3.1.36 Address Other Relevant Cap Types for PTW Remediation

Comment

For many reasons, including implementability, short-term impacts, and cost, EPA does not typically consider removing operating structures such as wharves and piers unless the cleanup cannot be done effectively without removal. However, the selected remedy seeks to address all PTW at the Site through either capping or dredging. It is not currently clear why Section 3.2.2 of the feasibility study ("Technologies Applied to PTW Areas") contains a sub-section describing containment technologies, but only describes significantly augmented reactive caps. We question why other relevant cap types used for addressing PTW are not also described in this section (e.g., reactive armored caps). Similarly, removal of PTW is not described in this section despite the fact that areas of PTW are subject to dredging. These omissions become confusing later in the document when these other technology types are applied to areas with PTW (e.g., EPA 2016b, Section 3.8.1), but their application to PTW is not described when the technology is originally presented (e.g., EPA 2016b, Section 3.4.7.4). These omissions compound our confusion when reviewing the technology assignment flowcharts. We suggest including descriptions of all technologies applied to PTW areas in Section 3.2.2 with a table to summarize when these technologies are used in each area (shallow, intermediate, river bank, and navigation channel/future maintenance dredge [FMD] regions) once the different regions are described.

EPA Response

Appendix D (Supporting Information for Alternative Development Feasibility Study) of the feasibility study report (USEPA 2016b) describes a set of generic cap designs that could be applied based on site-specific conditions, including the need for reactive materials to contain PTW and armoring to prevent erosion of the cap material. Remedial design sampling data will be used to apply the decision tree in the ROD and to inform the design in specific areas. Refer also to Section 2.5 of this responsiveness summary.

3.1.37 Use a Biologically Active Zone of 8 Rather than 4 Inches

Comment

EPA assumes a minimum thickness of 12 inches for the physical isolation layer of caps (EPA 2016b, p. D-15). This thickness is based on a maximum burrowing depth of 4 inches. (The 12 inches is

calculated based on the sum of the 4-inch burrowing depth [i.e., the biologically active zone], a 2-inch buffer, and an additional 6-inch layer to increase the travel time of dissolved contaminants.) The BERA (Windward 2013) defines the biologically active zone of the riverbed as the top 20 cm (about 8 inches), not 4 inches. Further, lamprey ammocoetes (a species of cultural significance to the Five Tribes) burrow up to 6 inches (Liedtke et al. 2015) and may have the ability to burrow up to 8 inches (T. Whitesel, personal communication, February 9, 2016). We thus support using a biologically active zone of 8 inches instead of 4 inches. We ask EPA to evaluate whether the physical isolation layer would need to be increased accordingly or whether the 12 inches would be sufficiently thick to protect lamprey ammocoetes and other burrowing organisms.

EPA Response

For the purpose of the feasibility study, a set of generic cap designs was developed to be applied based on site-specific conditions, including the need for reactive materials to contain PTW and armoring to prevent erosion of the cap material. To facilitate consistent application of capping technologies, all caps were assumed to be 36-inch thick and comprised of various combinations of sand, beach mix, activated carbon, organoclay, and armor stone. The precise composition and thickness of sediment caps will be determined during remedial design.

3.1.38 Consider Sandy Material with Higher Organic Content

Comment

Feasibility study report Section 3 refers frequently to sand caps and layers of sand placed either post-dredging or to accomplish ENR (e.g., EPA 2016b, p. 3-32). We encourage EPA to consider not just pure sand but sandy material with higher organic content. Silts and clays and associated organic matter in sandy material can greatly improve the filtering and sorptive capacity of the cap. Use of a more mixed sediment cap also has the potential to be a better match to the ambient river bottom and may therefore more quickly become ecologically compatible. We suggest using a more inclusive term like "predominantly sandy sediment" or "sandy material."

EPA Response

The precise composition and thickness of sediment caps will be determined during remedial design in accordance with the ROD decision tree and design requirements.

3.1.39 Address Concerns with Thin Layer Placement

Comment

The Five Tribes have persisting concerns about thin layer placement in the navigation channel/FMD region. The feasibility study states that "SMAs within the federally authorized navigation channel or designated as FMD are assigned dredging as a technology due to minimum water depth requirements, the placement of thin sand layers, in-situ treatment amendments, and conventional or reactive caps because stand-alone technologies above the established navigation dredge depth are considered incompatible with current and future waterway uses" and goes on to say, "Even in the case of dredging, navigation and maintenance dredge depth requirements will need to be considered during the design and implementation of dredging activities and the placement of any thin layer covers for managing residuals" (EPA 2016b, p. 3-10).

The first sentence is poorly structured and confusing regarding whether EPA considers thin sand layers, in-situ treatment amendments, and conventional or reactive caps all to be incompatible with current and future waterway uses. Although caps are often considered incompatible with navigation

channel/FMD regions, the latter sentence appears to include thin layer covers in remedial action for that zone. It is our understanding that a 12-inch sand cover will be applied to all dredging areas, including the navigation channel and FMD areas (EPA 2016b, p. 3-23). We request that EPA clarify this apparent discrepancy (i.e., between p. 3-10 and p. 3-23). This is an important issue, since dredging will be applied to significant stretches of these areas. The Five Tribes believe that thin-layer sand covers would be effective in managing residuals in these areas and thus would be appropriate; this is especially true if navigational dredging is not anticipated for many years.

EPA Response

In general, ENR is not planned for the navigation channel, but primarily as a residual management approach. Specific information associated with cap material, thickness of caps and/or types of cap layers are assumptions for the purposes of evaluating alternatives according to CERCLA criteria and developing cost estimates for the remedial alternatives. These assumptions were developed based on the existing data and will be finalized during the remedial design, after design level data to refine the baseline conditions are obtained.

If caps are used, the final depth would need to conform with planned and future navigation channel depths. See also Section 2.13.1 of this responsiveness summary.

3.1.40 Explain USACE Role in Dredging at the Site

Comment

It is our understanding that EPA is considering giving the U.S. Army Corps of Engineers (the Corps) the authority to conduct remedial dredging in the navigation channel. The Corps would pay for the dredging (through Congressional appropriations), and the responsible parties would pay for disposal of the material. If EPA adopts this approach, we urge EPA to ensure that the Corps is following all precautions, BMPs, and any other requirements the responsible parties would be required to implement.

It is also our understanding that the Corps will at some point conduct navigational dredging at the Site. Will this only occur after construction of the remedy, or might it occur concurrently with remedy construction (i.e., in MNR areas)? It is important that navigational dredging not interfere with the remedy, either by slowing down the remedy or by causing undue resuspension of contaminated sediment or recontamination.

EPA Response

EPA is selecting the final remedial action needed to address unacceptable risks present due to the contamination found at the Site. After the ROD is issued, EPA intends to seek performance of the remedy by identified PRPs. At this time, there has been no agreement that the Army Corps of Engineers will implement any part of the ROD as part of its navigation dredging.

EPA and the Corps have a Letter of Agreement on coordinating Corps dredge projects with EPA cleanup program. We anticipate continuing to work with the Corps under that agreement post-ROD. However, with the final ROD issued, EPA anticipates that future maintenance dredging within the Site will be evaluated consistent with the final ROD and cleanup levels for purposes of evaluating both what contaminant concentrations may be exposed by the dredging or maintenance activity, requiring BMPs during and after work is completed, and making decisions regarding where the dredged sediment can be disposed.

Various BMPs will be evaluated on location specific basis during remedial design, given the variability of conditions within the harbor. Details regarding sediment dispersion control and location-specific engineered rigid control measures will be determined during remedial design. Schedule of future maintenance dredging within the navigational channel will be coordinated during the remedy implementation.

3.1.41 Consider All Aspects of Using a CDF

Comment

We are open to the idea of constructing a confined disposal facility (CDF) to contain contaminated sediments on-site. Many of our concerns about capping, described above, also apply to CDFs. On balance, however, we feel that a CDF could be an appropriate, cost-effective solution for the disposal of large quantities of contaminated sediment. A CDF would greatly reduce risks and community disturbances related to transporting contaminated material to a landfill. In order for the Five Tribes to fully support a CDF, however, a number of criteria would need to be satisfied, as outlined in Table 3.4-7 of the feasibility study report and Table 8-1 of the CDF Design Analysis Report (Port of Portland 2011). The CDF must be designed to safely contain material in perpetuity, withstand a Cascadia Subduction Zone event, and be protective of human health and the environment. The design must include the best available technology (e.g., treating dredged sediment during placement) to enhance the performance of the CDF and prevent groundwater or effluent discharge from re-contaminating the river. Funds must be committed to monitor and maintain the CDF in perpetuity. The monitoring program must be comprehensive and detailed in the ROD, including but not limited to detailed emergency management and contingency plans. Material deposited in the CDF must meet rigorous standards: for instance, it must meet the substantive requirements of the 404(b)(1) guidelines under the Clean Water Act, must not be Resource Conservation and Recovery Act or state hazardous waste, and must be shown to be capable of being contained. ICs must be sufficient to protect the integrity of the CDF and prevent exposure to humans and the environment. There also must be measures in place to enforce the ICs.

In summary, although the Five Tribes prefer complete removal of contaminated sediments off-site, we could potentially support an upland CDF, if and only if the result on balance would be a more protective, permanent remedy (e.g., higher volume of sediment removal) and rigorous standards are fully met for its design, construction, operation, maintenance, and monitoring in perpetuity.

None of this section applies to a confined aquatic disposal (CAD) cell, which the Five Tribes would oppose in any instance. It is our understanding that the hydrology of the vast majority of the Site is too dynamic to safely contain subaqueous contaminated material. As noted in feasibility study Table 2.4-3, CAD cells have not been demonstrated to be capable of safely containing contaminated material at the Site in the long term. The design of a potential CAD cell has not been sufficiently advanced to demonstrate that implementation is feasible. Key types of modeling to support an evaluation of long-term effectiveness, such as contaminant migration, were not performed. Hydrologic and hydraulic modeling to address flood rise and flood storage also was not performed. Further, an evaluation of short-term impacts has not been conducted.

EPA Response

Refer to Section 2.14.1 of this responsiveness summary.

3.1.42 Enact Protective Advisories Quickly

Comment

EPA acknowledges that the current fish consumption advisories may not be sufficiently protective of all populations (EPA 2016b, p. 4-15). We agree that existing advisories are not adequately protective. We urge EPA to enact protective advisories as quickly as possible after the ROD is signed. These advisories should be based on existing data and can be revised if warranted based on data collected during remedial design.

EPA Response

Refer to Sections 2.3.2 and 4.14 of this responsiveness summary.

3.1.43 Reduce Contaminant Inputs to the Site

Comment

EPA asserts that the preferred alternative will achieve PRGs 23 years following construction (EPA 2016c). EPA estimates that at that time, at which point the Site will presumably be de-listed, safe fish consumption will be limited to 160 fish meals per 10 years (based on a non-cancer hazard of one). This fish consumption rate is significantly lower than the tribal consumption rate for resident fish that is used in the BHHRA (Kennedy/Jenks 2013) (1,380 resident fish meals per 10 years2). The Five Tribes find this discrepancy to be wholly unacceptable. We urge EPA to apply all available means to reduce contaminant inputs to the Site (e.g., from upstream, upland, and aerial sources) so that rates of safe fish consumption may be further increased in the future.

EPA Response

Refer to Sections 2.3.2, 2.3.3, 2.27.1, and 4.1.10 of this responsiveness summary. EPA recognizes that the remedy likely will not reduce the concentrations of PCBs and other contaminants to levels low enough to allow for consumption at the higher consumption rates associated with subsistence fishing. The scope of the CERCLA action is restricted to approximately 10 miles of the Willamette River, but upstream of the Site, background levels of PCBs from "clean" areas exceed the acceptable range based on conservative risk estimates, meaning that even with a more stringent remedy proposed. Fish advisories would likely remain in effect following the cleanup. However, these advisories are expected to be less restrictive under the selected remedy because the highest concentrations of bioaccumulative contaminants in sediment would be removed or capped such that they no longer enter the food chain within the Site. Watershed-wide implementation of source reductions through water quality programs by the DEQ in conjunction with source control activities at the Site are expected to contribute to the elimination of fish consumption advisories under EPA's ROD. Although CERCLA-related fish advisories would remain in place until cleanup levels are achieved, Oregon Health Authority may still impose an advisory based on broader watershed risks.

In response to this comment, background fish tissue concentrations were estimated for total PCBs using the Food Web Model and background sediment (9 µg/kg) and surface water concentrations (0.023 nanograms per liter). Allowable fish meals per month were then estimated for a range of exposure scenarios and risk ranges. Based on this calculation, the allowable fish meals/month would range from 0.08 to 14.2, or approximately 1 to 170 (8-ounce) fish meals per year. The allowable fish meals for an adult at the 1×10^{-5} risk level is 17 (8-ounce) meals per year. For comparison, adult exposure scenarios evaluated in the baseline human health risk assessment ranged from 28 up to 282 (8-ounce) fish meals per year, based on the tribal fish consumption rate of 175 grams per day.

3.1.44 Clarify Authority for Fish Consumption Advisories

Comment

We are unsure which entity will have authority to issue fish consumption advisories during the remedy (i.e., EPA or Oregon Health Authority [OHA]). If OHA will be the responsible agency, then EPA should provide OHA adequate funding (e.g., through a Cooperative Agreement) to implement the advisories and collect Site-specific data on fish tissue contaminant concentrations.

EPA Response

See Sections 2.3.2, 2.17.2, 2.17.3, and 4.1.14 of this responsiveness summary.

3.1.45 Ensure Fish Consumption Advisories Are Protective of All Groups

Comment

We request that fish consulption advisories be developed that are protective of all segments of the fishing community, including tribal fishers, and that the BHHRA (Kennedy/Jenks 2013) assumptions be used to develop the fish consumption advisories. This will require consumption advisories to be developed for multiple segments of the population, including nursing mothers, children, and other adults, as well as for consumption of fillets and whole-body fish. We also request that consumption advisories be developed based on the cumulative risk of all Site COCs, not just focused COCs.

EPA Response

See Sections 2.3.2, 2.17.2, 2.17.3, and 4.1.14 of this responsiveness summary.

3.1.46 Set Post-Cleanup Fish Consumption Advisories Using Pre-Cleanup Methods

Comment

As noted above, fish consumption advisories are expected to be needed after the Site is de-listed. Would OHA have authority for issuing and enforcing these fish consumption advisories? If so, we request that the fish consumption advisories be developed using the same methodology that will be used to set fish consumption advisories before the Site is de-listed (see our recommendations above). OHA's methodology for developing the current fish consulption advisories appears to be inadequate for protecting fish consumers.

EPA Response

See Sections 2.3.2, 2.17.2, 2.17.3, and 4.14 of this responsiveness summary.

3.1.47 Consider Migratory Fish Consumption Restrictions

Comment

Although EPA does not indicate that restrictions for consumption of migratory fish are currently necessary nor will be needed in the future, we urge EPA to thoroughly monitor contaminant concentrations in the tissue of migratory fish to determine whether fish consumption advisories for migratory fish are needed. Of specific concern to the Five Tribes, lamprey ammocoetes spend three to seven years burrowed in Site sediment and therefore are likely exposed to more Site contamination than other migratory fish like salmon, who spend only one to three years in freshwater before going to sea and who are not known to spend extended periods directly exposed to Site sediment.

EPA Response

See Sections 2.3.2, 2.17.2, 2.17.3, and 4.14 of this responsiveness summary.

3.1.48 Provide Assumptions for Use of Fish Consumption Advisories

Comment

The proposed plan outlines expected fish consumption advisories during construction (EPA 2016c, p. 58), but the underlying assumptions for those calculations do not appear to be described in either the proposed plan or the feasibility study report. For example, did EPA calculate expected water column concentrations during construction due to resuspension of contaminants and then model concentrations in fish tissue based on those water column concentrations? Do the recommended fish meal limits represent fillet or whole body consumption?

EPA Response

EPA did not calculate or model fish tissue concentrations based on water column concentration during remedy implementation. The fish tissue concentration was addressed in a more qualitatively way in the proposed plan (USEPA 2016c).

The recommended fish meal limits represent fillet consumption. Refer to EPA's memorandum, *Formal Dispute on the EPA Notice of Non-Compliance and Directed Revisions to the Portland Harbor BHHRA (Kennedy/Jenks 2013) and Request for Dispute Resolution; Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study, USEPA Docket No. CERCLA-10-2001-0240-Final Resolution* dated December 6, 2012.

For further response on the assumptions on fish consumption/tissue concentration see EPA response to LWG Dispute Response 1r (Appendix A of this document) and Sections 2.33 and 2.34 of this responsiveness summary.

3.1.49 Revisit Strategies for Fish Consumption Advisory Signage

Comment

The current fish consumption advisory signage at the Site has been inadequate to date. We request that the Site be well-signed and that regular inspection and maintenance of those signs occur. Furthermore, surveys of fishers should be conducted with each five-year review to determine the effectiveness of the fish consumption advisories. We urge EPA to consider culturally appropriate outreach strategies in addition to signage.

EPA Response

See Sections 2.3.2, 2.17.2, 2.17.3, 2.28, and 4.1.14 of this responsiveness summary.

3.1.50 Get Input on Whether ICs in Regulated Navigation Areas Will Be Burdensome

Comment

feasibility study Section 3.4.7.7 (EPA 2016b, p. 3-21) describes some of the ICs that will be needed on both a short-term and long-term basis after the remedy has been constructed. One such IC is waterway use restrictions, or regulated navigation areas (RNAs), which aim to ensure that the integrity of caps is maintained by prohibiting activities such as the anchoring of vessels. The area requiring RNAs for the Site will likely be orders of magnitude greater than the existing RNAs in the vicinity. The Five Tribes are unsure about the extent to which the RNAs would affect vessel operation. It is our goal to see an environmentally protective remedy chosen for the Site that will not significantly affect (i.e., restrict) human use of the river in perpetuity. We request that the Corps and other relevant parties be consulted to determine whether RNAs in the identified capping locations will be

burdensome. We would prefer their input as early in the process as possible. If RNAs would be burdensome, we urge EPA to remove contaminated material in order to avoid the need for RNAs associated with capping.

EPA Response
Refer to Sections 2.28 and 4.1.5 of this responsiveness summary.

3.1.51 Develop an ICs Implementation and Assurance Plan

Comment
The Five Tribes request that an Institutional Control Implementation and Assurance Plan be developed during remedial design. The development of this plan should be referenced in the ROD

EPA Response
See Sections 2.28 and 3.2.21 of this responsiveness summary.

3.1.52 Specify Frequency of Monitoring to Ensure ICs Are Effective

Comment
Monitoring of the effectiveness of ICs is critical to the success of the remedy. Certain ICs will need to be monitored, at a sufficient frequency and in perpetuity, including RNAs and land use/access restrictions. The ROD should specify the frequency of these types of monitoring, as well as actions that EPA will consider if the ICs are shown to be ineffective.

EPA Response
See Sections 2.28 and 3.2.21 of this responsiveness summary.

3.1.53 Ensure Flexibility in Implementation of Remedy

Comment
LWG has expressed concern that EPA's technology assignment approach is not nuanced enough. For instance, LWG seems concerned that remedial design data will indicate that dredging in a designated dredge area is not technically feasible, and another active remediation technology must be employed (e.g., a small area is too close to a major structure to be dredged to the required depth, or slope failure is predicted due to deep dredging depths in a confined area). It is our understanding, based on conversations with EPA, that if the ROD requires an area be dredged, the responsible parties do not have the flexibility to cap that area (i.e., if it entails a deviation from the technology assignment approach). A decision to cap in an area previously designated as dredge would require a ROD amendment. More broadly, if a point of flexibility is not specified in the ROD, it is not a flexibility that the responsible parties can exercise during remedial design in the absence of a ROD amendment. We generally support this approach and believe it is important for all interested parties to understand what the ROD does and does not allow. Transparency is essential.

EPA Response
See Section 2.24. EPA acknowledges that technology assignments will be evaluated based on new data and observations collected during remedial design. The ROD contains a revised, simplified flow chart for selection of remedial technologies during the remedial design process. The ROD decision tree indicates more clearly the flexibility for selection of remedial technologies with the assumption that a detailed evaluation of area-specific conditions would be conducted during remedial design. Remedial design investigations will consider prioritization of areas posing highest risk, sequencing, and other

aspects of how the remedial action will be implemented. Avoiding disturbance or recontamination of early action areas will be an important part of the remedial design evaluations. Construction of permanent caps will be carefully scheduled to avoid recontamination from upland or in-river work.

EPA is aware that area-specific conditions must be considered during remedial design, including the presence of active docks or other structures, caps and other remedial activities already in place, river uses, and many other considerations. Additional guidelines are provided in the ROD to convey this information.

The feasibility study states in several places that additional data will be collected during remedial design to assist in refining the remedy beyond the feasibility study-level of analysis and the ROD reflects this as well. EPA intends to evaluate additional data during remedial design to refine the following: delineation of contamination, selection and design of remedial technologies and construction methods, projections of natural recovery, treatment and disposal requirements, measures for aquatic and listed species protection, and compensatory mitigation requirements, to name a few.

3.1.54 Be Flexible in Remedy Implementation

Comment

We do consider it a possibility that remedial design data may indicate that an assigned technology is not feasible to employ at a particular location. Lacking in the proposed plan and feasibility study report is a description of how flexibility during remedial design would be granted, if at all, or how MOU partners would be involved. We request clarification in the ROD that MOU partners will be consulted when EPA is considering granting deviations from the selected remedy. The Five Tribes are generally in favor of responsible parties dredging in areas designated for capping (e.g., if they would like to avoid monitoring/maintenance costs for a cap), such as if material is under a structure that the responsible parties can remove. Conversely, the rationale for capping instead of dredging would need to be compelling to gain our support.

An example of where a small degree of flexibility may be needed is at the border of the shallow and intermediate regions in some cases. We understand that intermediate regions may be dredged to depths of up to 15 feet below the current mudline. The bathymetry of the adjacent shallow areas will be maintained. Therefore, there may be a significant difference in depth between these two adjacent areas. We are concerned about cap stability in shallow areas that are adjacent to areas up to 15 feet deeper. Even with an adequately shallow side slope, sloughing may occur, compromising the stability of the cap. EPA's assumptions are sufficient for feasibility study purposes; EPA likely intends to address this concern in remedial design. However, this example does raise the question of the degree to which EPA will grant the responsible parties flexibility during remedial design (e.g., deviations from the exact technology footprints resulting from a combination of sediment contamination data, RALs, and the technology assignment flowcharts). The Five Tribes expect to be involved in any considerations of deviations from the selected remedy.

EPA Response

During remedial design, debris and other area-specific features will be evaluated. The decision tree in the ROD has been revised to clearly outline this process. Also, EPA agrees that maintaining flexibility in construction methods through the remedial design phase is an important consideration, particularly for nearshore areas near structures and area with debris. Also see Section 3.1.53 of this responsiveness summary.

3.1.55 Engage MOU Partners in Evaluating Sampling Plans

Comment

We understand that new data will be collected during remedial design, and the result of these new data may be that the SMAs change in area. We do not consider this to be a deviation from the ROD or a flexibility. We do, however, request that EPA engage MOU partners in the evaluation of proposed sampling plans to collect new data, data quality assessments, and the use of new data, such as whether the new data should replace the old data (e.g., as evidence of recovery) or merely be added to it (e.g., due to the heterogeneous nature of the system).

EPA Response

Throughout the remedial investigation/feasibility study process, EPA fostered meaningful engagement with the MOU partner tribes and encouraged and facilitated Tribal involvement, including conducting formal Tribal consultations. EPA will continue this working relationship with the MOU partner tribes to ensure that tribal concerns and interests are considered.

3.1.56 Reevaluate Deposition Scoring

Comment

The deposition section of feasibility study Section 3.4.6.1 states that areas were evaluated using two lines of evidence: the difference in elevations between bathymetric surveys and the ratio of surface to subsurface sediment concentrations (EPA 2016b, p. 3-14). Figure 3.4-16 implies that only one of these criteria must be satisfied to consider an area depositional, as opposed to both needing to be satisfied. It also implies that a cell would only receive one score for the depositional category, not one score for each of the deposition lines of evidence. We instead request that either: (1) the two lines of evidence each receive their own score or (2) in order to receive a depositional designation, both lines of evidence must be satisfied. EPA's methods regarding the above points need to be clearly stated in the text.

EPA Response

See Section 2.26 of this responsiveness summary and LSS Dispute Issue 14 (Appendix A of this document).

3.1.57 Modify Deposition Area Scoring

Comment

In depositional areas, we think it would be most appropriate to assign a 0 rather than 1 to dredging since deposition is not an impediment to dredging. A depositional area may necessitate more dredging than a non-depositional area, but this possibility does not limit the application of this technology.

EPA Response

See Section 2.26 of this responsiveness summary and LSS Dispute Issue 14 (Appendix A of this document).

3.1.58 Change Preference for Capping When Scores Are Equal to Dredging

Comment

The feasibility study report states that "When dredging and capping score equally, capping is selected due to the lower initial capital cost." (EPA 2016b, p. 3-17). The Five Tribes disagree with this decision rule. As stated above, we have a strong preference for the removal of contaminated material. Further, the above quotation implies that EPA selects capping over dredging because it is more cost-effective.

We point out that capping generates long-term costs associated with monitoring, maintenance, and oversight of the caps. Because caps must be maintained in perpetuity, these costs may be significant and eventually eclipse the larger initial capital cost of dredging, in non-discounted terms. Without an understanding of the frequency of instances when dredging and capping are scored equally and the overall effect on the technology assignments due to this decision rule, we are in favor of selecting dredging, rather than capping, in the event of a tie.

EPA Response

See Section 2.26 of this responsiveness summary and LSS Dispute Issue 14 (Appendix A of this document).

3.1.59 Reconsider Applicability of Capping in Troublesome Areas

Comment

The matrix currently assigns a score of 1 to armored cap and cap categories in the presence of rock, cobble, or bedrock, and structures or pilings. The Five Tribes do not believe that these conditions favor these technologies. Rather, we believe that they neither favor nor limit the technologies. Thus, we feel these conditions merit a score of 0 for these technologies.

EPA Response

See Section 2.26 of this responsiveness summary and LSS Dispute Issue 14 (Appendix A of this document).

3.1.60 Address Inconsistencies in Technology Assignment Flowcharts

Comment

In general, we find the technology assignment flowcharts to be confusing since the text of the feasibility study does not always match what is presented in the figures. We provide two examples of these inconsistencies, though additional inconsistencies exist. First, the text of the feasibility study states that for river banks, "if NAPL or PTW that is not reliably contained is present, a reactive armored cap is assumed" (EPA 2016b, p. ES-9). However, Figure 3.8-1d does not show the use of a reactive armored cap. Instead, options include excavation with a significantly augmented reactive cap and excavation with an engineered cap. A second example is dredging in the shallow region. The feasibility study states that "the shallow region is assigned dredging with backfilling or capping after dredging to remove or contain contamination while maintaining water depths" (EPA 2016b, p. 3-11). However, Figure 3.8-1c does not specify that dredging will occur for NAPL or NRC PTW that is under a structure, despite the fact that a significantly augmented reactive cap with armor stone is the assigned technology. This problem exists for other cap types in the flowchart as well (e.g., reactive armored cap and armored cap) even though many technology descriptions do specify that dredging will occur. We understand that dredging is difficult under structures, but EPA has also stated its intention to maintain existing bathymetry in shallow areas. It is unclear which source, the feasibility study text or the figure, accurately reflects EPA's intentions. To reduce confusion, we strongly suggest ensuring that the text of the feasibility study and the technology assignment flowcharts are consistent. We support the use of significantly augmented reactive caps on river banks where NAPL or NRC PTW is present. We also support dredging before capping in the shallow and intermediate zones when NAPL or NRC PTW is present.

EPA Response

See Section 2.26 of this responsiveness summary and LSS Dispute Issue 14 (Appendix A of this document).

3.1.61 Use Capping Consistent Nomenclature

Comment

Related to the above comment, the term "reactive armored cap" is used consistently in the feasibility study, but the section where that type of cap is described is titled "armored reactive cap." We suggest using consistent nomenclature to avoid confusion.

EPA Response

Comment noted.

3.1.62 Remove as Much PTW and NAPL as Possible

Comment

As noted above, we strongly urge EPA to remove NAPL and NRC PTW if at all possible. Any structures impeding dredging of these materials should be seriously evaluated for the feasibility of removal. In line with our preference for removal of these structures, we suggest an additional decision point for NAPL and NRC PTW that are under a structure in shallow and intermediate regions (EPA 2016b, Figures 3.8-1c and 3.8-1b). This decision point should be "Can structure be removed?" A "Y" answer would lead to dredging rather than (or in addition to) a significantly augmented reactive cap. The Five Tribes expect to be involved in decisions regarding whether individual structures can be removed.

EPA Response

See Sections 2.5, and 3.1.53 of this responsiveness summary.

3.1.63 Apply Higher Standard for Deciding to Leave a Structure in Place

Comment

Similarly, for highly toxic PTW that is under a structure (in the intermediate and shallow areas), we support adding a decision point that asks "Can structure be removed?" A "Y" answer would lead to dredging. Because we prioritize removal of NAPL and NRC PTW that are under structures compared to highly toxic PTW under structures, we would support EPA applying a higher standard for leaving a structure in place for NAPL and NRC PTW compared to highly toxic PTW (i.e., EPA should go to greater lengths to remove structures prohibiting the removal of NAPL and NRC PTW compared to highly toxic PTW).

EPA Response

See Sections 2.5, and 3.1.53 of this responsiveness summary.

3.1.64 Address Lateral Migration under Caps

Comment

According to the shallow zone flowchart, if NAPL or NRC PTW is not under a structure and is at a depth of greater than 15 feet, then a reactive cap, rather than a reactive residual layer, would be used at the bottom of the dredge prism (also as described in EPA 2016b, p. 3-38). Although it seems less likely that the material would migrate vertically through a reactive cap and other material totaling 15 feet in thickness, we are concerned about lateral migration. How does EPA envision evaluating the potential for lateral migration during remedial design? The potential for lateral migration underscores the importance of removing NRC PTW if at all possible.

EPA Response

See Sections 2.5, and 3.1.53 of this responsiveness summary.

3.1.65 Minimize Capping in Shallow Areas where Possible

Comment

The shallow water flowchart indicates that, unless NAPL or NRC PTW is present, if the RAL concentrations are not expected to be reached within 5 feet of depth, the contaminated sediment will be dredged to 3 feet and replaced with an engineered cap + beach mix (also described in EPA 2016b, p. 3-38). The depth criterion in this analysis is an important decision point. Shallow areas provide important habitat and support numerous human uses; for these reasons, as well as reasons stated elsewhere in this document, the Five Tribes would like to minimize capping in shallow areas to the extent practicable. Figure 3.4-32h indicates that using the 5-foot criterion would leave substantial contamination in the river, especially for Alternatives E through G (EPA 2016b, Figures 3.4-32d through f). In contrast, using a 10-foot criterion would remove most of the shallow water contamination. We believe that the 10-foot criterion is more appropriate. However, we would consider supporting an intermediate depth, such as 7 feet, if the evidence showed that intermediate depth would be nearly as effective at removing contamination as the 10-foot criterion.

EPA Response

See Sections 2.5, 2.7, 2.26, and 3.1.53 of this responsiveness summary.

3.1.66 Address Intermediate Area Issues with Flowchart

Comment

The intermediate area flow chart indicates that an area originally assigned an engineered cap could be "demoted" to broadcast granulated activated carbon (GAC), ENR, or MNR (i.e., if the area is outside of RAL boundaries and outside of NAPL and NRC PTW areas; EPA 2016b, Figure 3.8-1b). We are concerned about an area originally assigned to capping being reassigned to a less protective technology. However, it is not clear which circumstances would lead to an original assignment of an engineered cap if the area was outside of RAL boundaries and neither NAPL nor NRC PTW was present. Is the "designated engineered cap" box in this section of the flowchart erroneous?

EPA Response

See Sections 2.5, 2.7, 2.26, and 3.1.53.

3.1.67 Incorporate the Same Decision Rule for Shallow Areas as Intermediate Areas

Comment

As illustrated in the intermediate area flowchart (EPA 2016b, Figure 3.8-1b), broadcast GAC is a meaningful change over MNR for reliably contained PTW through treatment using GAC that is outside of RAL boundaries. We support this assignment, but only if the area is depositional or neutral, not erosive. Similarly, MNR and ENR should only be applied in depositional and neutral areas. Dredging should generally be assigned to erosive areas. Additionally, we question why the shallow water flowchart does not illustrate this same set of decision rules related to highly toxic PTW outside of RAL boundaries (EPA 2016b, Figure 3.8-1c). We suggest incorporating this same decision rule for shallow areas.

EPA Response

See Sections 2.5, 2.7, 2.26, and 3.1.53 of this responsiveness summary.

3.1.68 Clarify Procedure if NAPL or NRC PTW Is Found at Depth

Comment

We assume that the following note on the navigation channel/FMD areas flowchart implies that EPA intends to remove all NAPL and NRC PTW in these areas: "All Concentrations greater than RAL alternative are less than 18 feet deep in the FMD and 15 feet in the Navigation Channel. The diagram is based on the assumption that no PTW or sediment concentrations are found below these depths" (EPA 2016b, Figure 3.8-1a). EPA should clearly state in the feasibility study text their intention to remove all NAPL and NRC PTW in these areas.

Additional sampling during remedial design may identify NAPL or NRC PTW below these previously-identified depths. If this proves to be the case, would the decision still be to dredge to the greater of the RAL depth or depth of PTW and then cover with a reactive residual layer, as indicated in the flowchart (EPA 2016b, Figure 3.8- 1a)? Or would this decision be invalidated based on EPA's note that the diagram is based on the assumption that NAPL and NRC PTW are not found below 18 feet in the FMD area and 15 feet in the navigation channel? We strongly urge EPA to remove all NAPL and NRC PTW in the navigation channel/FMD areas no matter the depth of contamination. Capping is impractical in these areas due to the use restrictions that capping requires. EPA must clarify their intention regarding the possibility of NAPL or NRC PTW being found below the specified depths. It is our understanding that the flowcharts in Figures 3.8-1a through d will form the basis for the remedy. Thus, they should be able to be applied to any findings during remedial design and should not be invalidated based on remedial design data.

EPA Response

See Sections 2.5, 2.7, 2.26, and 3.1.53 of this responsiveness summary.

3.1.69 Revisit Background Levels as Cleanup Progresses

Comment

EPA has consistently maintained that background levels of some COCs are high and will prevent the remedy from achieving all of the remediation goals. We encourage EPA to continue to work with DEQ, so that DEQ may continue to investigate and control upriver sources under their state authority. Since remedial design and construction will take many years, a sustained state effort upriver may improve conditions over this timeframe and allow all PRGs to be met post-construction.

EPA Response

See Sections 2.5, 2.17.3, 2.27, and 4.1.10 of this responsiveness summary.

3.1.70 Explore Additional Options for Upgradient Sites

Comment

The Five Tribes are concerned that cleanup standards used for areas in the Site that were previously remediated (e.g., McCormick & Baxter) may not be as stringent as the cleanup alternatives outlined in the proposed plan. If they are not as stringent, we request that a risk analysis be conducted using monitoring data for these areas in order to determine whether these areas are sufficiently protective based on the currently proposed cleanup standards. If not, we suggest exploring additional remediation options for these areas.

EPA Response

See Section 2.32.2 of this responsiveness summary.

3.1.71 Address River Bank Active Remediation Questions

Comment

We are concerned that only 65 percent of contaminated river banks are currently identified for active remediation. How does this 65 percent intersect with DEQ's current and future work on river banks? Will DEQ continue to evaluate the 35 percent of contaminated river banks not currently slated for remediation and then remediate them if they pose a risk for recontaminating areas of in-river work (e.g., evidence of slope failures and unconsolidated material versus armored shoreline)? Has some portion of this 35 percent already been evaluated and/or remediated by DEQ? Will EPA have the authority to remediate additional river banks if they gain supporting evidence of their recontamination potential during remedial design? Further explanation is needed to address the above questions.

Further, EPA notes that while increasing the extent of capping, dredging, in-situ treatment, or ENR for the in-river portion of the Site would be easily implemented for each of the alternatives if they failed to be sufficiently protective, "[a]dditional remediation on river banks could be more problematic due to factors such as adjacent land use, structures, steepness, use of the adjacent waterways, and community concerns" (EPA 2016b, p. 4-39). We are unclear on why additional river bank remediation would be more challenging than other types of remediation. If this is indeed the case, our concerns about DEQ's role in additional river bank remediation and the timing of that work are more salient.

EPA Response

Alternative F Modified addresses 78 percent of the contaminated river bank, and DEQ will continue to evaluate river banks which might pose recontamination threats to the in water remedy. See Sections 2.6 and 2.26 of this responsiveness summary.

3.1.72 Remediate a Higher Percentage of the Groundwater Plume

Comment

We are similarly concerned that only 33 percent of known groundwater plume areas would be addressed (i.e., with a reactive cap or reactive residual layer) under Alternative I. Groundwater plume areas that are not addressed may continue to serve as a source of contamination to the river and may recontaminate the river post-remedy. Even assuming that DEQ will continue to remediate groundwater sources of contamination, there are likely to be instances where "a portion of the plume… has moved beyond the control point and continues to seep into the river" (EPA 2016b, p. 3-6). If these plumes fall outside of the 33 percent of plume areas that EPA will address, it seems likely that they will continue to recontaminate the river. What justification can EPA provide to demonstrate that treatment of only 33 percent of these areas will support a protective remedy? In the absence of additional information, we support remediation of a much higher percentage of groundwater plume areas.

EPA Response

Alternative F Modified addresses 39 percent of the river bottom impacted by groundwater plumes (as currently delineated) through construction (Figure 4.2-24 and Table 4.2-6); the remainder of the contaminated groundwater would be left to MNR and/or be more dependent on the adequacy of the source control at this time. See Sections 2.6 and 2.26 of this responsiveness summary.

3.1.73 Use a More Protective Remedy – Based on Benthic Risk

Comment

EPA defines the benthic risk area as the area exceeding RAO 5 PRGs. Feasibility study report Figure 4.2-29 maps the benthic risk area against Alternative I SMAs, illustrating that a small percentage of the benthic risk area is encompassed by SMAs (17 percent), but larger percentages of the areas defined as 10 or 100 times (10x or 100x) the RAO 5 PRGs are encompassed by the SMAs (64 percent and 87 percent, respectively; EPA 2016b, Table 4.2- 7). Considering that the BERA (Windward 2013) benthic risk exceedance points are not well correlated with the 10x and 100x benthic risk areas (EPA 2016b, Figure 4.2-29), the percent of areas that are likely to pose a benthic risk (including the BERA points) that are encompassed by SMAs is considerably smaller than the values presented in Table 4.2-7. The poor correlation between the BERA benthic risk exceedance points and the 10x and 100x benthic risk areas, as well as high number of BERA points not actively remediated under Alternative I, support the need for a remedy that is more protective than Alternative I.

EPA Response

Alternative F Modified addresses 72 percent (10 x Benthic Risk) of the area with unacceptable benthic risks (ROD Table 12). See LWG Dispute Issue 1b (Appendix A of this document).

3.1.74 Address Issues with Beaches

Comment

Many questions persist around the concept of "beaches." Does EPA define beaches as above the high tide line or some other water-based or vertical datum, and is this area outside of the scope of active remediation? If so, what is the relationship between beaches and river banks (i.e., are beaches a subset of river banks, sediments, or neither)? What would be the mechanism for risk reduction on beaches (e.g., river bank capping, upland source control, deposition of cleaner material from the remediated Willamette River sediment bed during high water events)? These points should be clarified in the ROD.

EPA Response

For the feasibility study evaluation, EPA used geomorphic or topographical data to define river bank region with contamination. The ROD defines the river bank region to extend to the top of the bank. River banks are included as part of the selected remedy. The ROD had been clarified that beaches within a SMA will be treated similarly as the Shallow Region in the ROD decision tree.

3.1.75 Consider Additional Strategies in the Green Remediation Plan

Comment

Regarding the Green Remediation Plan outline presented in Appendix M, the Five Tribes encourage EPA to not only review BMPs for each technology and process, but also to identify ways to decrease the carbon footprint of the remedy on a Site-wide scale. For example, evaluating ways to minimize total energy use and maximize use of renewable energy will likely be a more feasible and cost-effective option when evaluated on a Site-wide scale rather than by individual technology or process. We also encourage EPA to consider employing strategies such as opting for time-of-use or market-based electricity pricing plans. For example, costs may be driven down by operating treatment systems at a heavier load during nonpeak, lower-cost hours and constructing small-scale renewable energy systems to supply power directly to certain components of a treatment system. Annual energy costs for implementing a remedy are typically high, so managing energy requirements creatively may help in driving down those costs (EPA 2011).

EPA Response

Comment Noted. A green remediation plan will be prepared as part of the remedial design phase of the project for each action. The plan will discuss how impacts will be mitigated to the extent possible and as part of this analysis rail and barge transport of wastes will be discussed, and used wherever possible to limit greenhouse gas emissions and lessen neighborhood impacts for air toxics such as nitrous and sulfur oxides, consistent with EPA national and regional guidance. Where trucking cannot be avoided, the plan will discuss optimum haul routes to minimize diesel exhaust exposure to sensitive subpopulations (known to cause childhood asthma), such as residential streets near schools.

3.1.76 Evaluate the Feasibility of an On-Site Transloading Facility

Comment

We understand that there does not currently exist an on-site transfer (transloading) facility to transfer dredged material to trucks or rail for permanent disposal at an off-site landfill. In the absence of an on-site facility, the material would likely be shipped by barge to a transloading facility on the Columbia River, where it would then be transferred to an off-site disposal facility via truck or rail. The proposed plan states that if an on-site facility is constructed, the material is expected to be transloaded to an off-site disposal facility via rail, rather than via truck (EPA 2016a, p. 31). We encourage EPA to thoroughly evaluate the feasibility of an on-site facility and to carefully weigh the environmental risks and benefits of each approach. Shipping material to an off-site facility on the Columbia River runs the risk of spilling contaminated material into the Columbia River either during transit or during offloading. EPA should also carefully weigh the environmental and community impacts of truck transport versus rail transport. Truck transport entails environmental risks and costs such as spills, fuel emissions, increased neighborhood traffic, and noise. An on-site transfer facility followed by rail transport may be the best option. When EPA has more details about the various options, we look forward to participating in the discussion to determine the best approach.

EPA Response

The 2016 feasibility study report (USEPA 2016) looks at modes of transport and associated transload of wastes from a macro perspective, but the primary assumption in the feasibility study was to use barges for the purposes of implementability and cost evaluation. The feasibility study also indicated that multiple modes of transport could be used and could be evaluated during remedial design phase of the project. As has been demonstrated on the Gasco and Terminal 4 early actions, transload facilities can be efficiently built and optimized to suit the needs of the Portland Harbor cleanup in a vicinity to landfills that often reduces greenhouse gas emissions by extending barge or rail haul mileage, and minimizes truck haul mileage. See also Section 2.22 of this responsiveness summary.

3.1.77 Select a Time Period Greater than 100 Years for Evaluation

Comment

EPA's evaluation of the ability of PTW to be reliably contained assumes a 100-year time period (EPA 2016b, p. D-20). The Five Tribes emphasize the importance of a remedy that is protective in perpetuity, not merely for 100 years. Would the results of the evaluation differ if EPA had used a longer time period? If so, we urge EPA to select a longer time period for the evaluation.

EPA Response

Representative Site conditions and capping options were modeled using this approach to determine the maximum concentrations of PTW material that would not result in exceedances of AWQC in the sediment cap pore water after a period of 100 years to be consistent with the long-term costing

conducted in Appendix G of the 2016 feasibility study report (USEPA 2016b). EPA does not believe that the results of the evaluation would have differed significantly if a longer time period had been used. EPA will extend this modeling time frame if future monitoring shows that the remedy may lose its protectiveness.

3.1.78 Ensure EPA's Definition of Shallow Water Matches that Used by NMFS

Comment

The feasibility study report explains that "The determination of 4 feet NAVD88 as the boundary for [the shallow] region was based on an assumed cap thickness of 3 feet (if capping were to be applied) and a mean low water level elevation of 7 feet NAVD88" (EPA 2016b, p. 3-11). We do not know how this definition of shallow water relates to the NMFS definition of shallow water of 20 feet below mean low water level. We support the authority of the NMFS for determining habitats that are of importance to fish. It is our understanding that EPA gives separate consideration to shallow water areas due to the important habitat value that these areas provide to aquatic life. We ask that EPA ensure that their definition of shallow water is consistent with the NMFS definition.

EPA Response

NMFS defines shallow water as above -15 feet CRD and EPA is coordinating with NMFS to ensure consistency. EPA will continue to coordinate with NMFS during remedial design to ensure sufficient consideration of Endangered Species Act and other non-ESA aquatic species. Habitat features will also be considered in other regions, as needed, for ESA and other non-ESA aquatic species. Also see Section 5 of this responsiveness summary.

3.1.79 Conduct a Flood Rise Evaluation Using a DMM Scenario

Comment

The Five Tribes do not agree with EPA's reasoning for not including Disposed Material Management (DMM) Scenario 1 in the Flood Rise Evaluation presented in Appendix P of the feasibility study report (EPA 2016b, p. P-3). Some uncertainties may exist regarding the siting and construction of the CDF. However, sufficient certainty exists (e.g., the existence of a 60 percent design and the assumption of the Terminal 4 location) to justify conducting a "cursory evaluation" of the sort presented in Appendix P. The CDF will undoubtedly convert a portion of the Willamette River into upland, which will affect flood rise. We request that EPA conduct such an analysis in order to allow for a more complete understanding of the effects of a potential CDF.

EPA Response

See Section 2.14.1.

3.1.80 Determine Dredging Practices that Are the Most Protective

Comment

The Five Tribes are very much in favor of the implementation of any measures that would prevent incidental and accidental discharges of contaminated materials into the water column. EPA identifies several BMPs and "precautions and controls" (EPA 2016b, p. 4-37). Unfortunately, factual support for the effectiveness of these methods is scant in the remediation literature. Implementation of these methods may not increase protectiveness and could decrease overall performance (for instance, in terms of construction duration and cost). The effectiveness of these methods should be examined. For instance, what are the impacts of installing and removing sheet piles? Do sheet piles disturb and redistribute contaminated sediment? How much of a carbon footprint is created by having to

manufacture, transport, install, remove, and recycle the sheet pile? What other wastes are produced in the process? BMPs such as sheet piles are often heavily marketed by vendors, but there is little sound science on their effectiveness. We ask that EPA review the relevant literature and consult with experts in remedial dredging to determine the measures with the greatest likelihood of reducing discharges and increasing environmental protectiveness.

EPA Response

See LSS Dispute Issue 16 (Appendix A of this document) and Sections 2.21 and 2.22 of this responsiveness summary.

3.1.81 Clarify Referencing of Figures 4.2-9 through 4.2-17

Comment

Figures 4.2-9 through 4.2-17 of the feasibility study appear to depict predicted ecological risk post-construction for each alternative. (We assume that, despite the figure captions, these figures are not intended to show residual risk as defined in the feasibility study; that is, risk once PRGs are achieved.) These figures are helpful in comparing alternatives. However, it is not clear how the depicted COCs were selected: some are focused COCs and some are not. These figures do not appear to be referenced in the text. We recommend that EPA include an in-text explanation of the figures.

EPA Response

Figures are referenced in the text under "Overall Protection of Human Health and the Environment" and "Long-Term Effectiveness and Permanence" for each alternative.

3.1.82 Use Enforcement Measures to Obtain PRP Compliance

Comment

We support a timely implementation of the remedy. Ideally, responsible parties will fully cooperate with EPA to construct the remedy as quickly as possible. However, if needed, we support EPA's use of enforcement actions to compel responsible parties to cooperate.

EPA Response

Comment noted.

3.1.83 Describe Decision-Making for Adaptive Management and Future Monitoring

Comment

The proposed plan and feasibility study provide insufficient detail on monitoring activities. The success of the remedy is dependent on diligent monitoring activities to identify and correct any potential technology failures before they cause widespread recontamination. Monitoring is also essential for determining whether the Site achieves protective levels within a pre-determined period of time; if it does not, a ROD amendment may be needed to require additional remediation. The importance of this monitoring cannot be overstated. As such, we strongly encourage EPA to provide additional information regarding their anticipated monitoring activities and reporting of monitoring data. In the ROD, we expect to see details regarding how often monitoring will be conducted, who will conduct it, who will oversee it, and what reporting will be required. We request that the ROD describe in detail the decision-making process regarding monitoring and adaptive management; specifically, how monitoring data will be used to inform construction activities and future monitoring.

EPA Response
See Sections 2.17 and 2.28.1 of this responsiveness summary.

3.1.84 Identify Time-Dependent Decision Points

Comment
The ROD should identify time-dependent decision points for the purpose of determining progress toward achieving remediation goals as well as the actions that would be taken should sufficient progress not be made. Specific standards or interim goals should be stated for each five-year review that would trigger the need for additional active remediation. For example, will EPA evaluate whether the cleanup actually achieves the interim targets post-construction? If interim targets are not met, what actions will EPA take? Because EPA assumes that interim targets will be met immediately post-construction, if these targets are not met by the five-year review, additional remediation may be warranted. The Site should be evaluated on a site-wide, SDU, and river mile basis. All relevant media (sediment, fish tissue, river bank soil, beach soil/sediment, surface water, pore water) should be considered.

EPA Response
Interim targets identified in the 2016 feasibility study report (USEPA 2016b) will be used as one of many lines of evidence that will be evaluated against empirical data collected under a robust monitoring plan for the Site to make sure the remedy is on track to achieve clean up levels.

3.1.85 Clarify the Schedule for Five-Year Reviews

Comment
EPA notes that "Upland source control measures will… need to be evaluated for necessary repairs and maintenance performed under five-year reviews of the CERCLA action" (EPA 2016b, p. 4-12). While we understand that a comprehensive review of upland source control measures will occur during the five-year reviews, it is our expectation that the success of individual upland source control measures, particularly more significant ones, will be evaluated more frequently than once every five years, either by DEQ or EPA. The frequency of monitoring should depend on the characteristics of the particular measure.

EPA Response
See Section 2.27 of this responsiveness summary.

3.1.86 Engage the Tribes throughout the Remediation Process

Comment
Of great importance to the Five Tribes is that we remain engaged throughout remedial design and be given opportunities to provide feedback, including instances where EPA is considering granting the responsible parties the opportunity to deviate from the ROD. We expect that our involvement during remedial design will include, but not be limited to, providing meaningful input on the development and review of work plans, sampling and analysis plans, data reports, monitoring, design plans, and granting any deviations from the preferred alternative due to unforeseen design or field challenges. In particular, we expect to be given the opportunity for input on the consideration of any additional remediation (through a ROD amendment) or a technical impracticability or other ARAR waiver.

EPA Response

Throughout the process, EPA has fostered meaningful engagement with the MOU partner tribes and has encouraged and facilitated tribal involvement, In accordance with EPA's Policy on Consultation and Coordination with Indian Tribes, EPA also held consultation meetings at tribal council locations from January 12 through February 4, 2016 and from July 19 through July 26, 2016, during the public comment period on the feasibility study report (USEPA 2016b) and proposed plan (USEPA 2016c). In addition, representatives for the Confederated Tribes and Bands of the Yakama Nation met with Administrator McCarthy on July 26, 2016 in Washington, D.C. A summary of the consultation meetings, along with any written materials provided, are in the Administrative Record.

The consultation process also included discussions on treaty rights, in accordance with the Treaty Rights Guidance. The Treaty Rights Guidance was issued to provide assistance on consultation regarding EPA actions occurring in a specific geographic area where tribal treaty rights may exist in, or treaty-protected resources may rely on, that area. Government-to-government consultations occurred in January and February of 2016 in anticipation of the proposed plan.[2] EPA will continue this working relationship for tribal input under the MOU and EPA's Policy on Consultation and Coordination with Indian Tribes, to ensure that tribal concerns and interests are considered whenever EPA actions may affect tribal communities – both related to treaty rights and other impacts. The ROD includes language regarding tribal coordination and consultation and community involvement in all activities post ROD.

The Portland Harbor Site is complex and the remedy preferred by EPA to perform an effective cleanup under these complexities will require an ongoing partnership and collective input from both the state and the tribes in communication with EPA, for critical decisions made throughout the implementation of the in-river cleanup.

3.1.87 Collect Additional Data Regarding Erosion and Deposition During Remediation

Comment

During remedial design, it is imperative to collect additional data regarding erosion and deposition trends in the Site. This will help in identifying areas that may be inappropriate for certain technology assignments (e.g., MNR in erosive areas). We suggest conducting field and laboratory studies to measure sediment stability (or erodibility) using tools such as Sedflume, Gust Microcosm, and consolidation tests.

EPA Response

The feasibility study states in several places that additional data will be collected during remedial design to assist in refining the remedy beyond the feasibility study-level of analysis and the ROD

[2] EPA Policy on Consultation and Coordination with Indian Tribes, May 4, 2011. Incorporates the Executive Order 13175 "*Consultation and Coordination with Indian Tribal Governments,*" November 2000 and Presidential Memorandum, November 5, 2009. See also EPA Policy on Consultation and Coordination with Indian Tribes: Guidance for Discussing Tribal Treaty Rights, February 22, 2016.

reflects this as well. EPA intends to collect and evaluate additional data during remedial design to refine the following: delineation of contamination, selection and design of remedial technologies and construction methods, projections of natural recovery, treatment and disposal requirements, measures for aquatic and listed species protection, and compensatory mitigation requirements, to name a few.

Specific tools required or used for pre-design investigation will be determined during remedial design phase and will be based on scope, objective and usability of the data.

3.1.88 Incorporate Effective BMPs in Remedial Design to Reduce Fish Mortality

Comment

In accordance with methods outlined in the working draft Programmatic Biological Assessment (FWS and NMFS 2016), we request that EPA incorporate effective BMPs during remedial design for reducing the mortality of fish, including lamprey, during construction (FWS 2010).

EPA Response

Comment noted.

3.2 Confederated Tribes and Bands of the Yakama Nation

3.2.1 Eliminate Health Advisories as a Result of Toxic Releases

Comment

Provide a cleanup that results in fish that are clean, healthy and safe to eat. The cleanup should be aggressive enough to eliminate health advisories as a result of toxic releases from Portland Harbor. The proposed plan uses fish consumption advisories, instead of adequate cleanup, to protect human health. The restoration timeframe of 30 years is unsupported and it is unknown if these ICs can ever be lifted.

EPA Response

EPA's strategy is to utilize a mix of technologies (including dredging, capping, ENR, and MNR) to address contamination in the waterway to the maximum extent practicable using engineering controls, and minimizing the use of ICs to further reduce risks. Together, these will protect human health and assure overall protectiveness of the remedy.

EPA recognizes that the remedy likely will not reduce the concentrations of PCBs and other contaminants to levels low enough to allow for consumption at the higher consumption rates associated with subsistence fishing. The scope of the CERCLA action is restricted to approximately 10 miles of the Willamette River, but upstream of the Site, background levels of PCBs from "clean" areas exceed the acceptable range based on conservative risk estimates, meaning that even with a more stringent remedy in place proposed fish advisories would likely remain in effect following the cleanup Therefore, fish advisories would remain in effect following the cleanup but would be less restrictive because the highest concentrations of bioaccumulative contaminants in sediment would be removed or capped such that they no longer enter the food chain within the Site. Watershed-wide implementation of source reductions through water quality programs by the Oregon Department of Environmental Quality in conjunction with source control activities at the Site are expected to contribute to the elimination of fish consumption advisories under EPA's ROD. Although CERCLA-related fish advisories would remain in place until cleanup levels are achieved, Oregon Health Authority may still impose an advisory based on broader watershed risks.

ICs will be used to prevent or limit exposure to contaminants on both a short- and long-term basis. Fish consumption advisories would be required until such time as RAO 2 is achieved as demonstrated through fish tissue monitoring. EPA expects to work with the Oregon Health Authority to revise the advisories to be consistent with the ROD. Outreach would be conducted to educate the public about the fish consumption advisories. Informational materials will be evaluated to determine advisory effectiveness. Thus, the feasibility study acknowledges that fish consumption advisories will be implemented after construction until PRGs are met and that the use of fish consumption advisories and education and outreach programs will provide additional risk reduction. Also see Sections 2.28 and 3.1.43 of this responsiveness summary.

3.2.2 Provide More Aggressive Cleanup in Erosional Areas

Comment

EPA used SEDCAM modeling along with several other lines of evidence (bathymetry, percent fines, propeller wash areas, wind/wake conditions, and subsurface to surface sediment concentration ratios) to forecast the success of MNR in reaching cleanup goals following active remediation. Given the great deal of uncertainty associated with modeling, EPA will focus greatly on the development of a robust monitoring plan following the ROD to evaluate achievement of cleanup goals with empirical data. The SEDCAM modeling results show that the selected remedy, Alternative F Modified, is protective within a reasonable timeframe given the uncertainty in the model. Prevent the release of contaminated sediments into the Columbia River. EPA's overreliance on natural recovery will allow for the continued release of persistent and bioaccumulative contaminants to the Columbia River, putting our fish and people at risk. In addition to using lower Alternative G dredge decision criteria, the ROD should provide more aggressive cleanup measures in erosional areas.

EPA Response

The selected remedy, Alternative F Modified further reduces reliance on MNR over the proposed plan's Alternative I (USEPA 2016c). The selected remedy does not overly rely on MNR. Although the selected remedy calls for 1,774 acres to be addressed by MNR, MNR is only designated to be applied to areas of low level contamination, where active remediation's impact to the ecosystem is considerably larger (on the order of decades of additional construction time) for the gains achieved. Based on the conceptual site model, areas with levels of contamination greater than the RALs where MNR would not be effective in reducing contaminant levels and ultimately risks, were assigned dredging or capping. A detailed baseline sampling program will be conducted in the remedial design phase to redefine areas suitable for active cleanup and for MNR. Specific monitoring goals to measure MNR progress will be developed in remedial design. Should MNR not achieve cleanup levels or progress sufficiently toward achieving them, additional actions (dredging, capping, or ENR) will be analyzed and may be implemented.

3.2.3 Clarify the Role of the Confederated Tribes and Bands of the Yakama Nation in Overseeing Cleanup

Comment

Include language regarding Yakama's Nation's role in overseeing the cleanup. The Yakama Nation expects to be fully engaged and an active participant in oversight throughout the cleanup process.

EPA Response

Throughout the remedial investigation/feasibility study process, EPA has fostered meaningful engagement with the MOU partner tribes and has encouraged and facilitated Tribal involvement. In

accordance with EPA's Policy on Consultation and Coordination with Indian Tribes, EPA also held consultation meetings at tribal council locations from January 12 through February 4, 2016 and from July 19 through July 26, 2016, during the public comment period on the feasibility study report (USEPA 2016b) and proposed plan (USEPA 2016c). In addition, representatives for the Confederated Tribes and Bands of the Yakama Nation met with Administrator McCarthy on July 26, 2016 in Washington, D.C. A summary of the consultation meetings, along with any written materials provided, are in the Administrative Record.

The consultation process also included discussions on treaty rights, in accordance with the Treaty Rights Guidance. The Treaty Rights Guidance was issued to provide assistance on consultation regarding EPA actions occurring in a specific geographic area where tribal treaty rights may exist in, or treaty-protected resources may rely on, that area. Government-to-government consultations occurred in January and February of 2016 in anticipation of the proposed plan.[3] EPA will continue this working relationship with the Yakama Nation under the MOU and EPA's Policy on Consultation and Coordination with Indian Tribes, to ensure that the tribal government's concerns and interests are identified and considered whenever EPA actions may affect tribal interests, including those related to treaty rights. The ROD includes language regarding tribal government consultation and coordination and community involvement in all activities post ROD.

The Portland Harbor Site is complex and the remedy preferred by EPA to perform an effective cleanup under these complexities will require an ongoing partnership and collective input from the Yakama Nation and the state in communication with EPA, for critical decisions made throughout the implementation of the in-river cleanup, including during five-year review evaluations of cleanup progress.

3.2.4 Uphold the Federal Trust Responsibility

Comment

EPA must uphold its federal trust responsibility by clarifying roles. EPA cannot delegate its federal trust responsibility to the State of Oregon. We are opposed to a state-led implementation of the in-river cleanup at the Site.

EPA Response

EPA is committed to maintaining its long-standing work with federally recognized Indian tribes on a government-to-government basis. Indeed, one of the key principles of the EPA Policy for the Administration of Environmental Programs on Indian Reservations (1984) is that "The Agency, in Keeping with the federal trust responsibility, [EPA] will assure that Tribal Concerns and Interests Are Considered Whenever Its Actions And/Or Decisions May Affect May Affect Reservations Environments." In the case of the Portland Harbor Site, EPA engaged in significant consultation and coordination with tribes, including holding face-to-face meetings at tribal council locations from January 12 through February 4, 2016 and from July 19 through July 26, 2016, during the public

[4] EPA Policy on Consultation and Coordination with Indian Tribes, May 4, 2011. Incorporates the Executive Order 13175 "*Consultation and Coordination with Indian Tribal Governments,*" November 2000 and Presidential Memorandum, November 5, 2009. See also EPA Policy on Consultation and Coordination with Indian Tribes: Guidance for Discussing Tribal Treaty Rights, February 22, 2016.

comment period on the feasibility study report (USEPA 2016b) and proposed plan (USEPA 2016c). In addition, representatives for the Confederated Tribes and Bands of the Yakama Nation met with Administrator McCarthy on July 26, 2016 in Washington, D.C. The consultation process also included discussions on treaty rights The Administrative Record contains a summary of the consultation meetings, along with any written materials provided. These consultation and coordination efforts took consistent with the EPA Policy on Consultation and Coordination with Indian Tribes and EPA Guidance for Discussing Tribal Treaty Rights. The Treaty Rights Guidance is designed to provide assistance on consultation regarding EPA actions occurring in a specific geographic area where tribal treaty rights may exist in, or treaty-protected resources may rely on, that area.

The ROD includes language regarding tribal coordination and consultation and community involvement in all activities post ROD. The Site is complex and the remedy preferred by EPA to perform an effective cleanup under these complexities will require an ongoing partnership and collective input from both the tribes and Oregon in communication with EPA, for critical decisions made throughout the implementation of the in-river cleanup.

EPA will continue this working relationship for tribal government input under the MOU, EPA's Policy on Consultation and Coordination with Indian Tribes and the Tribal Treaty Rights Guidance, to ensure that tribal concerns and interests are considered whenever EPA actions may affect tribal interests.

3.2.5 Meet Threshold Requirements for Protectiveness

Comment

Meet threshold requirements for protectiveness. The proposed plan does not meet or is uncertain to meet multiple interim risk targets.

EPA Response

As a long-term model is not available to predict the time to meet the PRGs, interim targets for risks and HIs were developed for feasibility study purposes. These targets will be used to evaluate each alternative's effectiveness in achieving cleanup goals both immediately after construction and long term.

Based on recommendations from the NRRB/CSTAG (see NRRB/CSTAG comment on Remedy Performance, p. 5), EPA performed an uncertainty analysis of each alternative to determine the likelihood that the Alternative would be significantly different from the No Action alternative. This analysis was presented in Appendix I of the 2016 FS, and the conclusion was that Alternative B post-construction SWACs were statistically indistinguishable from the No Action alternative and that the post-construction SWACs for Alternative D were still within the margin of error relative to no action. Although Alternatives B and D are expected to be protective of human health through ICs and MNR, the uncertainty of the post-construction SWACs indicates that Alternatives B and D may not be protective of the environment because of the time frame needed to achieve PRGs through MNR and ICs would not provide protection of ecological receptors during this time period. Alternative G is the only alternative to meet all interim targets; however, Alternative G involves a significantly greater amount of construction area and time (19 years), and thus, would have the highest cost, most impact to the community and Lower Willamette River ecosystem, workers and the environment during construction. Alternative G was not selected as the preferred alternative because of the difficulty associated with managing short-term impacts, the high cost and increased difficulty of implementation.

Five-year reviews will be conducted the purpose of which is to determine whether the remedy is, or upon completion will be, protective of human health and the environment. Should the remedial action or MNR not achieve cleanup levels or progress sufficiently toward achieving them and the corresponding ARARs, additional actions (dredging, capping, or ENR) may be required to meet the remedial cleanup goals (see Section 2.16.1 of this responsiveness summary).

3.2.6 Comply with ARARs

Comment

Comply with ARARs. The cleanup must comply with state water quality and hazardous substance remedial action rules for risk.

EPA Response

As discussed in Section 3.2.5, five-year reviews will be conducted the purpose of which is to determine whether the remedy is, or upon completion will be, protective of human health and the environment. Should the remedial action or MNR not achieve cleanup levels or progress sufficiently toward achieving them and the corresponding ARARs, additional actions (dredging, capping, or ENR) may be required to meet the remedial cleanup goals (see Sections 2.3.1 and 2.16.1 of this responsiveness summary).

3.2.7 Remove all PTW

Comment

Remove all PTW to assure maximum reduction of risk for the life of the remedy. It will take 100s to 1,000s of years for contaminants to degrade. Capping PTW in place provides little to no assurance that future releases will not occur on this time scale, and in a river environment that is set in a tectonically active region as well as subject to climate change.

EPA Response

Refer LSS Dispute Issue 17 (Appendix A of this document) and Section 2.5 of this responsiveness summary.

3.2.8 Protect Shorelines and Nearshore Habitat

Comment

Protect shorelines and nearshore habitat. A significant portion of the affected benthic receptors, as well as river bank and groundwater source areas are unaddressed in the proposed plan and need clarification in the ROD.

1. The river bank and groundwater cleanups should not be dealt with separately by the state, and should be addressed more specifically in the ROD.
2. A greater portion of the area exceeding benthic criteria should be cleaned up.
3. Higher value habitat areas should be given additional consideration for a more protective cleanup.

EPA Response

The selected remedy addresses not only the sediment, pore water and surface water of the lower Willamette River from approximately RM 1.9 (at the upriver end of the Port of Portland's Terminal 5) to RM 11.8 (near the Broadway Bridge), but also addresses portions of the river banks adjacent to

SMAs which were identified by DEQ during feasibility study development. River bank remediation has already occurred at some locations in the Site.

Refer LWG Dispute Issue1b (Appendix A of this document) for a discussion on benthic criteria.

The determination of higher value habitat areas can be further evaluated in the remedial design phase. See also Section 2.8.1 of this responsiveness summary.

3.2.9 Evaluate Upland Source Control and Provide Assurances

Comment

Include an evaluation of upland source control and provide assurances that upland sources will not affect the in-river cleanup efforts. Adequate upland source control measures must be in place prior to the cleanup to protect the river from recontamination. EPA needs to take a more active role in ensuring these source controls move forward and are adequate.

EPA Response

See Sections 2.26 and 2.27.

3.2.10 Include a Contingency Plan

Comment

Include a contingency plan. proposed plan projections for natural recovery of multiple contaminated media are unsupported and highly uncertain. A contingency plan with a clear decision criterion is necessary to correct the recovery trajectories if the Site is not adequately trending towards the cleanup goals.

EPA Response

See Sections 2.16.1 and 2.17.3 of this responsiveness summary.

3.2.11 Honor Confederated Tribes and Bands of the Yakama Nation Treaty Rights

Comment

The Yakama Nation is the legal successor in interest to the Indian signatories to the Treaty with the Yakamas of June 9, 1855 (12 Stat. 951). Under Article III of the Treaty, the Yakama Nation has reserved for itself and its members the right to take fish at all "usual and accustomed places." The term "usual and accustomed places", with respect to fishing, is defined as "every fishing location where members of a tribe customarily fished from time to time at and before treaty times, however distant from the then usual habitat of the tribe, and whether or not other tribes then also fished in the same waters." U.S. v. Washington, 384 F.Supp. 312 (W.D.Wash. 1974). Since time immemorial, Yakama people have migrated, lived, and fished in the Lower Columbia River tributaries. The Willamette River is recognized by the Yakama Nation as a usual and accustomed fishing place, and has always been an important food gathering area. Every June and July enrolled Yakama members travel to Willamette Falls to collect the culturally important Asúm eel, also known as the Pacific Lamprey, for traditional ceremonies and subsistence.

The nature and scope of the Yakama Nation's off-reservation treaty reserved fishing rights on the Columbia River and its tributaries has been extensively litigated through participation as an original plaintiff-intervener in the continuing jurisdiction case of United States v. Oregon (Civil No. 68-513-KI, D. Or.). See Sohappy v. Smith, 302 F. Supp. 899 (D.Or. 1969); United States v. Oregon, 913 F.2d 576

(9th Cir. 1990). In 1977, the Yakama Nation participated in the creation of the Columbia River Inter-Tribal Fish Commission, which provides technical and policy assistance to four treaty tribes in their management of Columbia River fisheries. In 2008 the parties to U.S. v. Oregon signed a ten-year Management Agreement for tribal and state co-management of Columbia River anadromous fish species, entered as an enforceable order of the U.S. District Court. The Yakama Nation is recognized as a trustee under CERCLA for any natural resources "belonging to, managed by, controlled by, or appertaining to" the tribe within the Columbia Basin, including in the Willamette River. 42 U.S.C. § 9607(f)(1).

In recent years, the Yakama Nation has participated as amicus curiae in numerous legal actions involving the National Marine Fisheries Service's administration of the Endangered Species Act with respect to listed salmon and steelhead stocks, to which the tribe holds treaty-reserved fishing rights. See, e.g., National Wildlife Federation, et. al., v. NMFS, et. al. (Civil No. 01-640-SI, D. Or); American Rivers, et. al. v. NMFS, et. al. (Civil No. 96-384-MA, D. Or). The Yakama Nation also protect its interests and legal rights via the following representative sample of activities: fish habitat restoration efforts, many of which are detailed in the Columbia Basin Fish Accords; participation in the ongoing processes for the development of Endangered Species Act Recovery Plans for listed salmon and steelhead; development and implementation of fishing management plans as a party to U.S. v. Oregon; implementation of the Pacific Salmon Treaty through participation in the Pacific Salmon Commission processes (see 16 U.S.C. 3631, et. seq.); and participation in a variety of other policy and technical committees and organizations dealing with issues related to the protection and rebuilding of salmon, steelhead, lamprey, and other species throughout the Columbia River basin.

Significantly, the Yakama Nation continues to participate in numerous environmental response actions throughout the Columbia Basin being conducted under both CERCLA and state cleanup laws. If the Yakama Nation conducts or participates in a response action it is entitled to recover all costs of removal or remedial action incurred by the tribe [that are] not inconsistent with the NCP. 42 U.S.C. § 9607(a)(4)(A); see also Confederated Tribes and Bands of the Yakama Nation v. U.S. Dept. of the Army, et. al. (Civil No. 14-1963-PK, D. Or), Findings and Recommendation (ECF No. 33, Dec. 18, 2015).

Based on these legal authorities, EPA in its Record of Decision must specifically acknowledge the role that the Yakama Nation will have in the design and implementation of the remedial action for Portland Harbor. The tribe's participation in the Remedial Design/Remedial Action (RD/RA) phase of the CERCLA cleanup is critical to the upholding of treaty reserved rights in the Lower Columbia Basin, and will also greatly assist in EPA's statutory mandate for protection of human health and the environment. EPA must ensure that the Yakama Nation has the means to fully engage with agencies and actively participate in oversight throughout the RD/RA process.

EPA Response

Throughout the process, EPA has fostered meaningful engagement with the MOU partner tribes and has encouraged and facilitated Tribal involvement, consistent with EPA's Policy on Consultation and Coordination with Indian Tribes, EPA also held consultation meetings at tribal council locations from January 12 through February 4, 2016 and from July 19 through July 26, 2016, during the public comment period on the feasibility study report (USEPA 2016b) and proposed plan (USEPA 2016c). In addition, representatives for the Confederated Tribes and Bands of the Yakama Nation met with Administrator McCarthy on July 26, 2016 in Washington, D.C. A summary of the consultation meetings, along with any written materials provided, are in the Administrative Record.

The consultation process included discussions on treaty rights, in accordance with the February 2016 Guidance for Discussing Tribal Treaty Rights (Treaty Right Guidance). The Treaty Rights Guidance was issued to provide assistance on consultation regarding EPA actions occurring in a specific geographic area where tribal treaty rights may exist in, or treaty-protected resources may rely on, that area. Government-to-government consultations occurred in January and February of 2016 in anticipation of the proposed plan.[4] EPA will continue this working relationship for tribal input under the MOU and EPA's Policy on Consultation and Coordination with Indian Tribes, to ensure that tribal concerns and interests are considered whenever EPA actions may affect tribes– both related to treaty rights and other impacts. The ROD includes language regarding consultation and coordination with tribal governments and community involvement in all activities post ROD. Further, once implemented, the cleanup will improve fish habitat and help further the tribes' rights to fish.

The Site is complex and the remedy preferred by EPA to perform an effective cleanup under these complexities will require an ongoing partnership and collective input from both the tribes and Oregon in communication with EPA, for critical decisions made throughout the implementation of the in-river cleanup.

3.2.12 Recognize Trust Responsibility

Comment

EPA has for many years expressly recognized its fiduciary duty toward Indian tribes. See, e.g., EPA Policy for the Administration of Environmental Programs on Indian Reservations (November 8, 1984) at 3. Federal courts have recognized the trust responsibility toward tribes in EPA's actions conducted under federal environmental statutes, including those affecting tribal resources outside Indian reservations. Nance v. Environmental Protection Agency, 645 F.2d 701 (9th Cir. 1981). EPA's most recent tribal consultation policy also reaffirms this principle as a foundation of its relationship with Indian governments. EPA Policy on Consultation and Coordination with Indian Tribes (May 4, 2011) at 3.

Courts generally hold that the nature of the trust responsibility and its specifics are defined by Congress. United States v. Mitchell, 445 U.S. 535 (1980). This includes a duty to protect the exercise of fishing rights reserved by a treaty with the United States. Parravano v. Babbitt, 70 F.3d 539, 546 (9th Cir. 1995). The duty is also enforceable in CERCLA through certain statutory provisions applying to treatment of Indian tribes enacted by Congress in 1986 through the Superfund Amendments and Authorization Act (SARA). 42 U.S.C. § 9626(a). These include the requirement that EPA consult with affected tribes "before determining any appropriate remedial action to be taken." 42 U.S.C. § 9604(c)(2). CERCLA also requires lead agencies to coordinate with tribes as trustees in "assessments, investigations, and planning" of all response actions. 42 U.S.C. § 9604(b)(2); see also 40 CFR § 300.615(c)(1)(ii). CERCLA and the NCP should be construed broadly to include the remedial

[4] EPA Policy on Consultation and Coordination with Indian Tribes, May 4, 2011. Incorporates the Executive Order 13175 "*Consultation and Coordination with Indian Tribal Governments,*" November 2000 and Presidential Memorandum, November 5, 2009. See also EPA Policy on Consultation and Coordination with Indian Tribes: Guidance for Discussing Tribal Treaty Rights, February 22, 2016.

design/remedial action (RD/RA) phase of response actions in these fiduciary duties. See, e.g., Carson Harbor Village v. Unocal Corp., 270 F.3d 863 (9th Cir. 2001).

However, the federal government may not delegate its trust responsibilities to state agencies. See Assiniboine and Sioux Tribes v. Board of Oil and Gas, 792 F.2d 782 (9th Cir. 1986). This is a critical issue for the Portland Harbor cleanup because Oregon Department of DEQ has expressed an interest in implementing either part or all of the RD/RA phase of the in-river cleanup. Whether this is done directly through CERCLA or under the Oregon Environmental Cleanup Law, ORS 465.200 et. seq., EPA will still retain a fiduciary duty to the tribe to protect its legal interests under the Treaty of 1855. For this reason, the Yakama Nation objects to any transfer of oversight to DEQ. Our concerns are especially relevant to ensuring that the remedial action meets appropriate cleanup standards for treaty protected fisheries, as well as the expected negotiation of funding and participation agreements with PRPs for the RD/RA phase.

As you know, our experience with Yakama's participation in the Astoria Marine Construction Co. (AMCCO) site in Clatsop County has been a glaring illustration of what can go horribly wrong when EPA transfers or delegates its authority to the State of Oregon. In 2012, Region 10 deferred its proposed placement of the site on the NPL by placing oversight in the hands of DEQ. One of the conditions that EPA had put on the deferral was assurance of support for tribal involvement, and both DEQ and AMCCO were clearly notified that this would involve funding of tribal participation as well. However, in the past four years AMCCO has engaged in numerous disputes with the Yakama Nation regarding a number of funding issues, including annual budgets, indirect costs, and attorney fees. These disagreements jeopardized the tribe's full participation, and created unprecedented cost overruns and administrative headaches. DEQ meanwhile took a "hands off" approach to these problems, arguing that it has no authority to enforce or otherwise get involved with the company's funding of Yakama's participation in the cleanup. This approach has also been exemplified by the lack of coordination by DEQ project managers at other sites including Bradford Island and Mosier.

Unless EPA ensures that the tribe will have an enforceable mechanism for ensuring that EPA upholds its trustee role in the context of state remedial actions, the Yakama Nation must oppose any plan to delegate in-river cleanup responsibilities to DEQ. Any transfer of oversight to the State of Oregon without any written guarantee that the Yakama Nation's cleanup role will be adequately recognized and funded, or the tribe's treaty resource interests strictly protected, will be considered a serious violation of EPA tribal consultation policies and fiduciary duties.

EPA Response

In a February 2001 Memorandum of Understanding (USEPA 2001), it was agreed that EPA would take the Lead Agency role and DEQ would take the Support Agency role for the in-river cleanup while DEQ would take the Lead Agency role and EPA would take the Support Agency role for addressing upland and upriver contamination that may impact the Willamette River. EPA expects that cleanup work conducted as part of this ROD will be performed by the PRPs under CERCLA authorities and EPA oversight. In order to maximize resources and achieve cleanup as soon as possible, there may be an opportunity for DEQ to perform certain technical oversight functions, in coordination with EPA, at specified areas of the in-river portion of the Site. Any oversight functions performed, whether performed by EPA or DEQ, will comply with CERCLA, the NCP, the ROD, any CERCLA agreements reached between the agencies and work parties, and EPA policy and guidance regarding CERCLA cleanup actions. Throughout the cleanup process, EPA will maintain its commitment to consultation and coordination with tribes and act in accordance with its tribal trust responsibility.

ICs with respect to the governmental entity that will provide enforcement authority will be determined during the development of remedial design and identification of responsibility in an ICs implementation and assurance plan and an operation and maintenance plan. These plans will be developed jointly by a team made up of representatives from EPA, DEQ, tribes, Oregon Department of State Lands, Coast Guard, Oregon Marine Board, Oregon Department of Transportation, USACE, City of Portland, Port of Portland, and others.

3.2.13 Revisit Site Boundaries versus Study Area

Comment

To date, EPA has failed to take into consideration the releases from the Site to the lower Columbia River. The proposed plan does not adequately describe the loading and potential impacts to resources beyond the Site boundaries. We argue that the Site boundaries are really a "study area", which is the terminology used in the original Remedial Investigations. By CERCLA definition, a site includes anywhere a hazardous substance has come to be located. Contamination from the Site does not stop at the downstream Site boundary. However, for the sake of expediency, EPA and the PRPs artificially and arbitrarily truncated the downstream Site boundary, leaving downstream Site contamination unaddressed. Data conclusively show that Site contamination exceeds toxicity criteria at and beyond the downstream boundary and that Site contaminant loads are transported further downstream and into the Columbia River.

EPA Response

See Section 2.2.10 of this responsiveness summary.

3.2.14 Monitor for Impacts to Species

Comment

Harmful and toxic pollutants from the Willamette River are carried into the Columbia River and have been found in salmon below the confluence of these two rivers. Portland Harbor is contributing highly toxic PCBs, DDT, polycyclic aromatic hydrocarbons (PAHs), dioxins/furans, and other persistent and bioaccumulative pollutants to the Columbia River. As a result, the health of juvenile salmon in the Columbia River is impaired by exposure to these contaminants. Juvenile salmon slow down and spend extra time in the Columbia River estuary to acclimate, feed and grow before heading out to sea. Pacific lamprey and sturgeon are also at risk from these toxic substances. Lamprey ammocoetes live and feed in the Site sediments for up to 7 years before migrating; however, Site monitoring to date on lampreys has been inadequate. Resident fish downgradient of the arbitrary Site boundary have not been adequately monitored for contaminants, despite the known sediment loading to the Columbia River.

EPA Response

See Sections 2.2.10, 2.16, 2.17, 2.23, and 2.33.2 of this responsiveness summary.

3.2.15 Recognize Impacts on Endangered Species Recovery Efforts

Comment

Federal, state, tribal, and many local partners are working to support the recovery of salmon, steelhead, and other Endangered Species Act listed fish species in the lower Columbia River and its tributaries. Since 1978, Bonneville Power Administration has invested $2.68 billion in fish recovery in the Columbia River watershed. Considerable resources (on the order of $200 million annually) are directed towards these efforts in order to abate the decline of these species and move toward their

recovery. The inadequacies of the proposed plan are contradictory to these investments of public dollars in fisheries recovery.

EPA Response
See Subsection 2.19 of this responsiveness summary.

3.2.16 Follow NRRB Recommendation on Columbia River Impacts

Comment
The National Remedy Review Board and Contaminated Sediments Technical Advisory Group (the boards) review of the Draft Feasibility Study resulted in the following recommendation4: "The boards note that several stakeholder comments indicate that Portland Harbor releases are contaminating the Columbia River downstream of the Site." "The boards recommend that the decision documents contain a clear explanation as to how the Region believes effective remediation of Portland Harbor sediment should reduce contaminate loading to the Columbia River's surface water, sediment, and biota." It is key for the Region to elucidate where contaminants migrate to or be deposited outside the boundaries of the Site, given the Region's interpretation that the Portland Harbor Site is not largely depositional, but erosional or transitory in nature.

Although we appreciate the Columbia River contaminant loading estimates that were added to the Site Feasibility Study, the proposed plan is grossly inadequate and relies on scouring and off-Site transport of contaminated sediments for the majority of the Site area.

EPA Response
See Sections 2.2.10 and 2.17.3 of this responsiveness summary.

3.2.17 Follow Recommendations of the Confederated Tribes and Bands of the Yakama Nation

Comment
It is important to the Yakama that the Portland Harbor contamination is cleaned up for all species, the health of the Yakama, our neighbors, and future generations. Contaminant loadings to the Columbia River must be reduced to the greatest extent possible. The ROD must develop a monitoring framework for evaluating contaminant loading to the Columbia River, assess the effects to aquatic biota, and finish delineating the extent of where Portland Harbor contamination has come to be located, as required by CERCLA. The effectiveness of the cleanup is critical to support the recovery of salmon, lamprey, and steelhead (and other species) in these waters and therefore a more comprehensive Alternative G must be implemented.

In addition, any resolution of liability agreement between EPA and the responsible parties must not prevent future actions outside the Portland Harbor Site boundaries where Portland Harbor contamination is transported through or has come to be located.

EPA Response
See Sections 2.2.10, 2.16, and 2.17.3 of this responsiveness summary.

3.2.18 Explain Why Threshold Criteria Are Not Met

Comment

The proposed plan does not adequately demonstrate that the Preferred Alternative (Alternative I) would comply with the two CERCLA threshold requirements: (1) overall protection of human health and the environment and (2) ARARs. 40 CFR § 300.430(f)(1)(i)(A); see also 42 U.S.C. § 9621(d)(2)(A). In addition, it will result in fish consumption advisories for perpetuity.

EPA Response

EPA's primary criteria for selection of a Superfund remedy are protection of human health and the environment and compliance with the substantive requirements of federal and state environmental laws. Once these criteria are satisfied, EPA determines the best balance of tradeoffs among the alternatives with respect to balancing criteria, one of which is cost, and modifying criteria, including community acceptance, which includes a wide spectrum of often competing concerns. As stated in ROD Sections 12.1 and 12.2, Alternatives E, F, G and I all meet the two threshold criteria of Overall Protection of Human Health and the Environment and Compliance with ARARs.

3.2.19 Address Issues in Meeting Threshold Criteria

Comment

Protection of human health and the environment is the statutory standard for cleanup under CERCLA. 42 U.S.C. § 9621(b)(1). Under the discussion of this criterion, interim risk targets for end of cleanup construction were developed by EPA "to specify the level of risk that is ideally achieved through active cleanup" and to determine if alternatives are likely to achieve remedial action objectives that are based on human health or ecological risk. It is then presumed that if interim risk targets are met, then compliance with ARARs would be achieved within a reasonable timeframe after construction through natural recovery processes. However, Alternative I is not anticipated to meet the interim risk-based targets for RAOs 1, 2, and 6, and therefore may not achieve the associated ARARs within a reasonable restoration timeframe. As noted in the Portland Harbor Feasibility Study, for several RAOs "there are no current means to quantitatively assess the effectiveness of the alternative in achieving [preliminary remediation goals] PRGs", for some "there is insufficient information to evaluate" whether the RAO will be achieved, and for others no clear quantitative goal is presented (RAOs 3, 4, 7, 8 and 9). See Table 1 for a summary of interim risk targets.

EPA Response

See Sections 2.3 and 2.7 of this responsiveness summary.

3.2.20 Address Issues with ARARs

Comment

ARARs identified, but not met by PRGs, for the Site include measures of protectiveness of human health and the environment required in the Oregon Hazardous Substance Remedial Action Rules. These include:

- A 1 in 1,000,000 (1×10^{-6}) lifetime excess cancer risk for individual carcinogens.
- A 1 in 100,000 (1×10^{-5}) cumulative lifetime excess cancer risk for multiple carcinogens.
- A hazard index (HI) of 1 for non-carcinogens.

- Toxic substances may not be introduced above natural background levels in waters of the state in amounts, concentrations, or combinations that may be harmful, may chemically change to harmful forms in the environment, or may accumulate in sediments or bioaccumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare or aquatic life, wildlife, or other designated beneficial uses (OAR 340-041-0033).
- The formation of appreciable bottom or sludge deposits or the formation of any organic or nonorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry may not be allowed (OAR 340- 041-0007(11)).

In addition, EPA's proposed plan does not comply with the Clean Water Act. In 2000, the EPA published guidance and recommendations on the use of fish and shellfish consumption advisories in determining attainment of water quality standards and listing impaired waterbodies under Section 303(d) of the Clean Water Act (EPA 2000) 5, which includes the following statement: "EPA generally believes that fish and shellfish consumption advisories and certain shellfish growing area classifications based on waterbody specific information demonstrate impairment of Clean Water Act section 101(a) "fishable" uses. This applies to fish and shellfish consumption advisories and certain shellfish area classifications for all pollutants that constitute potential risks to human health, regardless of the source of the pollutant."

Based on our review of the proposed plan and communications with EPA, it is apparent that fish consumption advisories will be needed at the Site, possibly in-perpetuity. Based on EPA guidance, this advisory would impair the designated use of a fishable lower Willamette and Columbia rivers, and would not comply with ARARs based on state water quality standards.

EPA Response

Refer LSS Dispute Issue 8 (Appendix A of this document), Sections 2.3.2, 2.4.2, 2.8.1, 2.28, 2.33, 2.34, and 4.1.9 of this responsiveness summary.

3.2.21 Avoid Over-Reliance on ICs

Comment

The cleanup plan for Portland Harbor under the Preferred Alternative will rely upon ICs, non-engineered measures intended to affect human activities in such a way to prevent or reduce exposure to hazardous substances, to prevent or limit exposure to contaminants for humans, not only during construction activities, but permanently and forever. ICs have no ability to reduce ongoing ecological exposures. ICs will include, but are not limited to, commercial fishing bans, fish and shellfish consumption advisories, signs and fences on adjacent upland areas, enhanced community outreach programs, waterway and land use restrictions through covenants or restricted navigation areas, or other dredging and structural maintenance restrictions in capping area. The reliance on ICs will be for perpetuity.

These ICs are in place of adequate cleanup, do not fully protect human health and the environment, do not fulfill trust obligations, and place the burden of cleanup (or rather inadequate cleanup) on the health of community and environment rather than on the PRPs.

EPA Response

See Sections 2.3.2, 2.17.6, and 2.28, 2 of this responsiveness summary.

3.2.22 Remove All PTW

Comment

The proposed plan does not call for complete removal of PTW at Portland Harbor. In addition, dredge depth limits were established for the purpose of cost estimation, but not justified, within the proposed plan. Based on current data and conversation with EPA, we see the greatest potential for significantly high concentrations, mass, and volumes of pollutants to be left in place in sediments adjacent to Arkema and NW Natural Gas.

All PTW should be removed and removal should be as complete as possible. Highly toxic wastes and non-aqueous phase liquids identified in sediments as PTW should be addressed through removal and treatment, as required. We recommend that, once baseline monitoring is complete and vertical delineation of sediment contamination is known, remedy design select complete removal, over capping, wherever possible. Treatment options should ensure that river character, flooding habit, or regional events such as earthquakes and impacts from climate change, do not affect that overall efficacy of the mitigation of these toxic wastes.

EPA Response

See Section 2.5 of this responsiveness summary.

3.2.23 Address Lack of a Consistent, Conservative Approach and Additional Uncertainties

Comment

EPA's evaluation of risk lacks consistent, conservative approaches to evaluating Site risk. In addition, EPA's evaluation of alternatives does not address the underlying uncertainty of success. Many of the methods used for evaluating risk at the Site are not conservative, have a high-level of associated uncertainty which is not adequately addressed in the proposed plan or in the Feasibility Study, and are not in line with current regulations or based on site-specific knowledge.

1. EPA indicates that the development of alternatives is based only on a subset of the COCs present at the Site and under the assumption that addressing a small group of 6 "focused COCs" would address risk associated with all 64 COCs. The development of RALs, interim risk levels, and the estimated duration to achieve RAOs are not based on all Site COCs which under-represents the true risk that will remain after construction and the duration required to achieve RAOs. Although focusing on a subset of COCs may be acceptable for simplifying remedy design, EPA must not lose sight of the fact that there are still 64 COCs contributing to toxicity. The ROD should specify that cleanup levels, other compliance metrics, and future evaluations must estimate the cumulative effects of all Site COCs.

2. PRGs should be developed for all COCs and use maximum exposure assumptions, such as higher fish consumption rates and protective scenarios for Tribal fishers. The Yakama religion and culture teaches us that every fish caught is considered a gift from the provider and is not to be wasted. Therefore, resident fish caught during salmon fishing are also consumed.

    a. Residual cancer risk and non-cancer HIs for RAO 2 (human consumption of fish and shellfish) were calculated using risk-based PRGs assuming a fish consumption rate based on a national consumption rates (per the BERA) which

are lower than the regional data available for Oregon and Pacific Northwest-specific fish consumption rates and tribal heritage rates. This may underestimate residual risk and HIs for RAO 2. No tribal member should be put at risk as a result of Portland Harbor contamination. At a minimum, tribal heritage consumption rates6 should be used for setting cleanup levels.

b. Residual risk and HIs for RAO 2 were calculated differently for the Site-wide risk estimates (national rate of 142 grams per day) relative to the river-mile risk estimates (using a lower fish consumption rate of 49 grams per day). Documentation within the Feasibility Study does not indicate the appropriateness of this substitution which may result in an underestimation of the residual risk by river-mile. Consistency and conservatism should be used for remedy selection as well as future evaluations and compliance metrics.

c. Residual risk and HIs for RAO 2 were calculated using risk-based sediment PRGs protective of fish/shellfish consumption and likely underestimate the total residual risk for all COCs. In the feasibility study, it is stated that "risk-based sediment PRGs protective of fish/shellfish consumption were not developed for arsenic, hexachlorobenzene, mercury, BEHP, pentachlorophenol, and PBDEs because a relationship between fish and/or shellfish tissue and sediment concentrations could not be determined." Residual risk calculations should estimate the cumulative risk for the Site and include all Site COCs.

3. EPA concedes that "estimating the number of acceptable fish meals at the end of construction is not a precise calculation, but is rather a prediction that has some degree of uncertainty." However, no discussion of the uncertainty is presented, undermining the validity of these comparisons. A discussion of uncertainty surrounding the fish consumption issue must be included.

4. The Preferred Alternative does not reduce risk to acceptable levels post-construction. The RALs and interim risk targets are not protective. Allowing for varying RALs across the Site that are orders of magnitude different in concentration and risk does not make sense and is not protective of receptors, especially benthic organisms, organisms utilizing shallow and higher habitat value areas, and beach users. The interim risk targets set for the 9 RAOs are not achievable by Alternative I and/or are unclear. Only one interim risk target (RAO 5, sediments, protection of benthic receptors) is predicted to be met under Alternative I, although it sets the bar low with a limited target of cleaning up only 50 percent of sediments in areas exceeding 10 times the PRGs. Alternative I leaves the majority (83 percent) of the benthic receptors exposed to long-term unacceptable risk (by exceeding one or more PRGs) and they cannot be protected by ICs. Interim risk targets for impacted river bank and groundwater-to-surface water discharges are not clearly stated and these sources are left largely unaddressed in the proposed plan with no clear direction on cleanup goals or plans on the areas not included in Alternative I. Surface water interim risk targets are not defined either. Alternative G RALs should be selected to provide a cleanup that will be more protective post-construction and more likely to achieve longer-term RAOs. The ROD should provide clearer directives and post-cleanup construction goals for all impacted media, including river banks, groundwater plumes and surface water.

5. The feasibility study and the proposed plan provide little, if any, quantifiable support that achievement of the RALs, interim risk targets, and PRGs will allow the final RAOs to be achieved in a reasonable period of time. The level of uncertainty in the ability of any of the alternatives to achieve acceptable risk levels is also never discussed. The uncertainties included in each alternative, in addition to the potential risk that each alternative may not achieve the RAOs in a reasonable period of time, should be clearly discussed.

In order to address the uncertainty in the evaluation of the alternatives and the likelihood that the alternatives achieve RAOs, a conservative and protective approach should be taken for selecting an appropriate alternative. Alternative G with modifications is the feasibility study alternative that best meets these criteria. In addition, the ROD must use a consistent and conservative approach to calculate and select protective interim cleanup goals and final cleanup levels.

EPA Response

Section 3 of the 2016 feasibility study report (USEPA 2016b) discusses the development of the alternatives; evaluation of the alternatives, including how risks are addressed through the proposed RALs and SMAs, is discussed in Section 4. The RALs are concentrations of focused COCs that are meant to cover all COCs posing risk to various receptors at various spatial scales. Thus, the RALs in combination, not individually, are meant to address all COCs, not just the specific focused COC. The RALs, therefore, apply everywhere within the Site where any PRGs are exceeded. The focused COCs were chosen based on their coverage of other COCs. None of the alternatives address all the risks at the Site through construction, with the exception of Alternative H. In the evaluation of alternatives in Section 4, EPA discusses those risks that are not addressed by the construction of the alternatives so that it is clear how much risk was addressed and how much remains to be addressed through MNR. EPA does not "demerit" or characterize this evaluation as a "failure" for any of the alternatives. Further, Alternative F Modified uses a consistent set of RALs outside the navigation channel, taking more active remediation steps to further reduce reliance on MNR over the proposed plan's Alternative I (USEPA 2016c). See Sections 2.3, 2.6, 2.7, 2.20.3, 2.26.4, 2.27, 2.31, 2.33, and 2.34 of this responsiveness summary.

3.2.24 Follow NRRB Recommendations on Risk Level Uncertainty

Comment

The boards' review of the proposed cleanup action resulted in the following important recommendation that was overlooked or not included in the proposed plan, and should be included in the ROD. The levels of risk identified and communicated in documents prepared by the Region omit important information to evaluate uncertainty in some exposure pathways and do not fully address supporting information on the conclusions presented about risk to human health and the environment "…based on the information represented to the boards, some conclusions about risk did not fully communicate the risk characterization (the severity, spatial, or degree of confidence of the risk estimate) and how the remedy components will address Site risks." "The boards recommend that the decision documents clearly explain how the proposed remedial action would achieve each RAO."

EPA Response

EPA has explained in the ROD how the selected remedy would achieve each RAO.

3.2.25 Discuss Areas that Will Not Be Cleaned Up

Comment

The proposed plan represents a partial cleanup that over relies on natural recovery (primarily dispersion) and will result in the continued release of persistent and bioaccumulative contaminants downstream to the Columbia River. The feasibility study states, "Since much of the Site is erosional or transitional (deposition in some parts of the year and erosional in others) and contaminant mass exists in the river sediment, there is the potential for the contamination to be transported downstream." The feasibility study also states, "The area where contamination in sediment exceeds the human health PRGs within the Site is approximately 2,190 acres and 30,048 lineal feet of river bank", which encompasses essentially the entire Site. In addition, the feasibility study and proposed plan confirm that river banks and groundwater plumes are an ongoing source of contamination to the Site. A significant amount of the Site will not be cleaned up and will continue to be a source of contaminated sediments to the downstream Multnomah Channel and Columbia River.

EPA's remedy should not leave so much of the contamination unaddressed, especially given the significant uncertainties that the PRGs will ever be met. The proposed plan will NOT address:

- 87 percent of the sediment area exceeding human health risk PRGs;
- 67 percent of the contaminated groundwater plume area;
- 83 percent of the sediment area exceeding benthic risk PRGs;
- 35 percent of the length of contaminated river banks;
- and unclear amounts of risk from surface water to receptors and from prey to predators.

These are site-wide post-construction estimates. By compositing site-wide risk, significant areas of the river sediments would present much higher risks, and some lower.

The proposed plan compares alternatives in terms of percent of area or length cleaned up and interim (post-construction) or residual risk. However, the ROD should also should provide estimates of the volume and mass of contamination at the Site both before and after cleanup construction. This information will be further refined through the remedial action in phase in order to report on the volume and mass of contamination removed, capped, treated, and left behind for all impacted media.

EPA Response

As described in Section 4.1.3 of the feasibility study, the evaluation of overall protection of human health and the environment is based on post construction sediment concentrations and does not consider the mass of contamination removed. Similarly, as described in Section 4.1.5 of the feasibility study, the evaluation of long-term effectiveness and permanence is based on the methodology and assumptions presented in the BHHRA (Kennedy/Jenks 2013) and BERA (Windward 2013). Exposure point concentrations for post-remedial exposures are based on modeled estimates of contaminant concentrations in sediment at the completion of construction.

The feasibility study identified areas for dredging or excavation based on site-specific factors that may limit the effectiveness of containment in-situ treatment, ENR or MNR. Within the navigation channel or future maintenance dredge areas, removal was required to prevent restrictions on navigation. In the intermediate depth areas, a multi-criteria decision matrix was developed as a method to guide the

assignment of capping and dredging technologies, based on specific site characteristics within SMAs. In shallow areas, a mix of shallow removal followed by capping or placement of backfill was utilized to maintain current water depth and thus limit the loss of shallow water aquatic habitat. Alternative F Modified uses a consistent set of RALs outside the navigation channel, taking more active remediation steps to further reduce reliance on MNR over the proposed plan's Alternative I (USEPA 2016c). See also Sections 2.16.1, 2.26.4, and 2.27 of this responsiveness summary.

3.2.26 Address Non-Compliance with Short- and Long-Term Risk Goals

Comment

EPA's evaluation of short-term or post-construction risk (at 7 years after the start of cleanup) clearly shows that Alternative G would come closer to achieving all interim risk targets (Table 1), would result in lower risk to receptors, and would bring a much larger area of the Site closer to compliance with long-term PRGs and RAOs (Table 2).

As demonstrated by Table 3 below, EPA's proposed plan evaluation of long-term or residual risk at the end of the recovery period or reasonable restoration timeframe (time = 30 years) is very incomplete and unclear. We would argue that the residual risk calculated for RAOs 1, 2 and 6 are also unknown and that the long-term effectiveness of Alternative I, or Alternative G for that matter, is highly uncertain.

Feasibility Study Alternative G with modifications addresses more of the contaminants and remedial action objectives than Alternative I, the proposed cleanup. Within the ROD there should be a transparent process with clearly defined criteria for each type of contaminated media at the Site that will be used to evaluate compliance with interim targets and cleanup levels upon completion of each phase of construction and at the completion of construction activities. This process should be used to evaluate the success of the active cleanup by evaluating the level of risk that remains at the Site upon completion of construction activities. If risk levels and compliance criteria do not comply with stated goals, then contingency efforts should be implemented to ensure that the cleanup moves toward achieving the RAOs by reaching remediation goals and the target residual risks within the stated recovery timeframe. Risk calculations should be conservative and include all COCs and not be limited to compounds where there is a direct correlation between sediment concentration and fish tissue.

EPA Response

Refer to LSS Dispute Issue 8 (Appendix A of this document) and Sections 2.6, 2.17, 2.31, 2.33, and 2.34 of this responsiveness summary.

3.2.27 Lessen Reliance on MNR

Comment

Reliance on MNR is neither appropriate for all assigned site areas, nor is it supported by Site data. The Preferred Alternative (Alternative I) relies on MNR to achieve remedial cleanup levels over 1,876 acres, or 87 percent of the Site. Greater removal of hotspots (lower RALs) as well as additional dredging of targeted higher priority areas is needed.

The selection of MNR for persistent and bioaccumulative chemicals, such as those found at Portland Harbor, is a practice that is widely discouraged in both mainstream science, as well as multiple federal and state guidances. These chemicals will take 100s to 1,000s of years to break down and will continue to affect the ecological food web for much longer than the reasonable restoration timeframe.

Based on a natural recovery evaluation presented in the feasibility study, two of the Sediment Decision Units (SDUs, RM 6NAV and RM 11E) "scored unfavorable for natural recovery", and over the remainder of the Site "natural recovery processes are neutral." The evaluation clarifies that this does not indicate that natural recovery is not occurring, "but rather that it is less likely to occur through depositional processes." The feasibility study information on depositional rates also indicates that the majority of the Site is characterized as either erosional or "transitional." However, the feasibility study and proposed plan text make conclusions contradictory to the supporting data and evaluations. The feasibility study concludes that the "primary mechanism for MNR is through deposition." The proposed plan characterizes the Site as increasingly depositional, with the exception of river miles 5 to 7. These broad-sweeping, over-generalized conclusions stated in Feasibility Study and proposed plan about the Portland Harbor Site (or major portions thereof) being a depositional environment, and therefore ideal for MNR, are misleading and not supported by site data or evaluations. They must be corrected.

Since natural recovery for MNR areas of the Site is "less likely to occur through depositional processes" it appears that for the majority of the Site area dispersion is the primary mechanism being relied on for natural recovery. Because of this, contaminants remaining in the areas proposed for MNR (87 percent of the Site) would likely be mobilized and transported downstream and into the Columbia River where they will continue to contribute impacts to Treaty-reserved resources. This non-transparent and unstated expectation that dispersion will be the primary cleanup mechanism for up to 1,876 acres of persistent and bioaccumulative toxicity is irresponsible.

In addition, Alternative I relies on leaving contamination in place, without consideration of ecological use, habitat values or plans for restoration. This does not take into account the need for connectivity, or a linear sequence of non-toxic and restored habitats that provide habitat for resting, feeding and predator avoidance along fish migratory routes throughout the Portland Harbor corridor. For example, Alternative I selects the highest concentration (least protective) RALs at the most downstream end of the Site, an area that encompasses 4 pending restoration projects (PGE Harborton, Linnton Plywood, Miller Creek, and Alder Creek) and Sauvie Island properties that have the potential for higher habitat value. The ROD needs to select a remedy that provides greater protectiveness in areas with higher habitat value and ecological use.

Because a long-term model is not available to predict the time to meet the PRGs, interim targets for risks and hazard indices were established to evaluate the potential for achieving PRGs in a reasonable time frame, which was considered to be 30 years. However, the alternatives that rely most heavily on MNR, including the Preferred Alternative, fail to meet the interim targets for several RAOs, and for other RAOs there is insufficient information to evaluate the likelihood of meeting the remedial cleanup levels. While there is significant uncertainty in the assumption that achieving interim targets post-construction will result in achieving PRGs in a reasonable time frame, it is even more uncertain when the Preferred Alternative would not even result in meeting the interim targets.

One of the factors in determining whether a recovery time frame is reasonable is the uncertainty associated with the time frame prediction. However, the proposed plan does not discuss this uncertainty. The ROD must provide sufficient information to support the statement that 30 years is a reasonable time frame, and that the Preferred Alternative will achieve RAOs within that time frame, including a discussion of uncertainties. It should also include a clearer timeline for pre-construction activities, cleanup construction start and completion, restoration timeframe start and completion, monitoring and ICs, administrative steps, etc.

The ROD should select Alternative G with modifications to expand dredging along heavily used shoreline areas, in shallow water critical habitats, in areas with restoration or mitigation plans, in areas with higher potential for recontamination due to upland sources, and in highly erosional segments. It is more likely to meet interim risk-based targets, significantly reduce the uncertainty associated the remedy's ability to meet remedial objectives, and improve ecological function of the corridor. The proposed plan also needs to include a summary of upland source control effectiveness and how ongoing sources will affect natural recovery.

EPA Response

See Sections 2.6, 2.16, 2.21, and 2.31 of this responsiveness summary.

3.2.28 Address Uncertainty with ENR

Comment

Enhanced monitored natural recovery using a thin layer (ex. 6 inches +/- of sand with activated carbon) is not a proven remediation technology for the Portland Harbor Site suite or concentrations of COCs and in sediments of similar characteristics. EPA states in the Duwamish ROD responsiveness summary that "The only relatively new technology proposed is the use of activated carbon with ENR, which is why pilot testing will be conducted before determining where and how to implement this technology." We understand that for this reason, ENR pilot studies will be conducted in various plots at the Duwamish Site to better understand that ENR methods (similar to those described for Portland Harbor) will even be an effective technology.

EPA also clarifies that ENR is only appropriate for low scour potential areas with lower contaminant concentrations. However, the Preferred Alternative proposes significant use of ENR in areas with higher scour potential, such as Swan Island Lagoon. In addition, the proposed plan states that monitoring and ICs are typically not required for ENR.

The over reliance on ENR is highly uncertain in its long-term effectiveness and does not support treaty rights. We argue that the need for ENR should be minimized by increasing the dredge footprint, its use should be avoided in higher scour potential and non-depositional areas and in areas of boat traffic, it is only appropriate for low levels of contamination, pilot studies are needed to confirm its effectiveness, and monitoring and ICs are necessary.

EPA Response

See Sections 2.6, 2.16, 2.21, and 2.31 of this responsiveness summary.

3.2.29 Mitigate Nearshore Habitat Impacts

Comment

The lower Willamette River provides habitat for a variety of animals (invertebrates, fish, birds, mammals, amphibians, reptiles) and aquatic plants which has been designated by the National Marine Fisheries Service as a critical habitat for several threatened or endangered salmon species that migrate through the Site.

The Yakama Nation has treaty-reserved or other fishing rights in areas impacted by the Site. Protection of these rights depends upon the success and permanence of the cleanup implemented. The Preferred Alternative does not adequately address the protection and mitigation of these key habitat areas. Alternative G will provide greater long-term, more permanent, mitigation of contaminated sediments along shorelines, shallows, and higher-value habitat areas and in areas exceeding benthic

criteria to help further a safer, healthier, and more abundant fishery in the lower Willamette River. In addition, ongoing, controlled discharges from groundwater and other upland sources that continue to pollute the river should be addressed immediately, and implementation of remedies should be done in a manner that avoids, minimizes, or compensates for habitat disturbance or loss. Nearshore water quality and habitat must be adequately cleaned up and protected to support a healthy and sustainable fishery.

EPA Response

See Sections 2.6, 2.8, 2.26.3, 2.26.4, 2.27, and 2.31 of this responsiveness summary.

3.2.30 Address Contamination at McCormick and Baxter Superfund Site

Comment

Yakama has concerns about the significant amounts of contamination left behind at the McCormick and Baxter Superfund Site, located within the Portland Harbor Superfund Site. We understand that a ROD amendment for McCormick and Baxter will be prepared following the release of the Portland Harbor ROD and look forward to commenting on it. Short-term and long-term performance of the McCormick and Baxter remedy must be adequately monitored and evaluated, and contingencies implemented if warranted. This remedy must be protective of, and not re-contaminate the Portland Harbor cleanup. In addition, the relationship between the McCormick and Baxter Superfund Site and the Portland Harbor Superfund Sites should be more clearly explained in the ROD.

EPA Response

See Section 2.32.2 of this responsiveness summary.

3.2.31 Explain Cost Estimate Inaccuracies

Comment

The accuracy of cost estimates associated with the alternatives is of concern. The proposed plan and the Feasibility Study do not present data or provide scientific information that supports the assumption that the Site will be cleaned up within a 30-year time frame. Therefore, in order to accurately compare costs of a selected remedy, the cost for each alternative should incorporate a contingency or probability factor for each alternative that incorporates the possibility of that alternative not reaching cleanup goals within the 30-year time frame. If cleanup goals are not met, additional remedial activities are likely to be required at additional cost. For example, the probability of achieving remedial cleanup levels within a reasonable time frame (estimated at 30 years) using Alternative I is much less than if Alternative G was selected. Therefore, costs associated with implementing Alternative I to reach cleanup goals could be greatly under estimated if additional remediation is needed later. In addition to potential future dredging costs that would be needed in 30 years if RAOs aren't met, there would be other additional costs as well. These repeat costs may be avoided if a more thorough cleanup alternative, such as Alternative G, is selected now to increase the probability of meeting RAOs.

Many of the costs associated with addressing Site issues are not included in the cost evaluation for each of the proposed alternatives and the estimates proposed may not represent actual costs to implement any of the proposed alternatives. For example, contaminated sediment in the navigation channel does not appear to be included in costs estimates. These costs may be deferred to other agencies, like the U.S. Army Corps of Engineers, who will be required to address contaminated sediments during maintenance dredges of the channel and deepening the navigation channel. In

addition, costs associated with mitigating groundwater contamination or recontamination from adjacent upland sources are not included the estimated costs. Cost estimates do not consider efforts to address controlled upland sources impacts river sediments and surface water quality.

EPA Response

See Section 2.22 of this responsiveness summary.

3.2.32 Change Heavy Bias On Cost in the Remedy Decision

Comment

The messaging and politics surrounding cost and effectiveness have been heavily biased and have resulted in a remedy selection that is primarily cost-based. If allowed, EPA's Preferred Alternative I would be a big win and a huge cost savings for the responsible parties (and their insurers), and a huge loss for the health of the community and environment.

Yakama recommends Alternative G with modifications However, it is disappointing that EPA's feasibility study did not present a suite of alternatives that met CERCLA threshold criteria. Understanding that anything we propose outside the feasibility study would not likely be considered by EPA, we are forced to work with this Alternative G because we feel that it offers the greatest protection of Alternatives A through I. This is a frustrating situation, however, recognizing these limitations we propose that, with the additional modifications offered here-in, Alternative G would help prioritize protection of important environmental resources.

The Lower Willamette Group (LWG) has continuously drawn their lines based on cost and has disrespectfully pressured EPA to choose a more "reasonable" (i.e. cheap) remedy by lobbying intensely, investing in public outreach, and littering the Site Record with one-sided accusations towards EPA, while ignoring their own role in feet dragging and refusing to conduct adequate site investigations. To date the responsible parties have been successful in applying political pressure to EPA, who has repeatedly and inappropriately allowed cost savings to be the dominant or primary remedy selection criteria. The selection of a remedy must not be dismissive of the remaining CERCLA evaluation criteria. EPA and the responsible parties continue to publically broadcast a biased, non-transparent sales-pitch (or "public outreach campaign") highlighting reductions in contamination, but minimizing the facts regarding what contamination, risks, and restrictions will remain. In addition, the responsible parties have included exaggerated scare tactics in their outreach about how cleanup will cause a loss of jobs and that cleanup costs will be transferred to the public. A more fair discussion and evaluation of cost should include the economic benefits from cleanup, which have proven to be substantial elsewhere.

Yakama Nation's recommendation for Alternative G IS reasonable and more protective than Alternative I. For example, the Portland Harbor Site is often compared to the Lower Duwamish Waterway Superfund Site (Duwamish) in Washington. The Portland Harbor Site is 5 times larger by area than the Duwamish Site. However, EPA's Preferred Alternative I, in comparison with the Duwamish ROD, has higher (less protective) PCB RALs and PRGs, would only dredge 1.5 times more sediment, be roughly 2.5 times more expensive, and take the same length of time to implement. Yakama Nation's preferred Alternative G, in comparison with the Duwamish ROD, also has higher PCB RALs and PRGs, but would dredge roughly 5 times more sediment, be roughly 5 times more expensive, would take less than 3 times longer to implement. While this comparison is a far cry from a cost analysis, it highlights the fact that Portland Harbor is a much larger "mega Superfund" site with much greater contamination problems and therefore should be expected to cost more. To reiterate, both

Alternatives I and G would leave behind greater concentrations of contaminants (and resulting risk) than the Duwamish ROD.

Portland Harbor involves over 150 PRPs, is comprised of multiple NPL and non-NPL listed cleanup sites and a large upland source area. If dealt with individually Portland Harbor cleanup would be much more expensive to cleanup than collectively. By cooperatively working together with EPA as one large mega-Site, the responsible parties have the potential for significant cost savings.

In addition, experience has shown that sites that choose cheaper, partial cleanups risk being more expensive in the long run due to factors such as monitoring and O&M expenses over longer recovery periods, lack of natural recovery due to remaining contamination, remedy failure, unresolved contamination liability issues, decreased property value, inability to pursue loans, etc. We have witnessed multiple sites where cleanup had to be supplemented or, in some cases, even redone. One doesn't need to look very far for case studies. For example, recent news coverage on the 2009 Hudson River PCB sediment cleanup indicates post-cleanup monitoring results have spurred the New York State Department of Environmental Conservation (who provided state concurrence on the ROD) to demand additional cleanup.

The responsible parties and their insurers must be called to task. Polluters must pay to restore the health of the river. It is not conscionable (or allowable by CERCLA) to expect that the health of the people and environment must instead pay in order to preserve the profits of the responsible parties.

EPA Response

See Section 2.22 and 2.23.2 of this responsiveness summary.

3.2.33 Provide Detail to Substantiate Remedy Selection Conclusions

Comment

The Preferred Alternative (Alternative I) is a very limited or partial cleanup, riddled with uncertainties, inconsistencies, contradictions and uncertainties. However, the feasibility study and proposed plan conclude that Alternative I "would comply with ARARs", would be protective of human health and the environment, would meet the threshold criteria, and would reduce fish consumption advisories in a reasonable restoration timeframe. The reality is that these conclusions are not supported in the proposed plan or site record. In addition, a decision to choose a cheaper remedy that does not meet threshold requirements cannot be allowed by CERCLA. Among other problems, Alternative I would result in fish consumption advisories on the Lower Willamette River due to contaminants from the Site to be in place after construction of the remedy, after the recovery period of 30-years, and likely forever. The ROD should provide a more detailed evaluation to substantiate remedy selection conclusions, particularly in light of the preferred alternatives' inability to achieve interim targets. Of the action alternatives, a modified Alternative G appears the most likely to achieve interim targets for the greatest number of RAOs, and would therefore be the alternative most likely to comply with ARARs and result in fish consumption advisories more in line with the rest of the Willamette River.

EPA Response

See Sections 2.6, 2.21, 2.27, and 2.31 of this responsiveness summary.

3.2.34 Perform Key Studies

Comment

A number of key studies are needed in order to develop an accurate and comprehensive understanding of the Site. This information will be required for remedy design, evaluation of implementation progress, future evaluation of compliance with remedial cleanup levels, and to assess if Site RAOs are achieved.

- Background and Downstream Baseline and Ongoing Monitoring: Background concentrations in surface water, sediment, and fish tissue will need to be established upstream of Portland Harbor. Similarly, impacts downstream of the Site should also be assessed and catalogued for comparison, assessing migration of contamination, and evaluating impacts to the Columbia River before and during implementation of the remedy. Monitoring should include the Willamette River, Multnomah Channel, and Columbia River downstream areas.

- Delineation: Within Portland Harbor, the distribution and depth of contaminants throughout the Site should be documented for remedy design, among other concerns, in order to ensure that Principal Threat Waste has been successfully treated or removed and to record where contamination will be left behind.

- Sediment Transport and MNR: Given the Preferred Alternative relies heavily on MNR (with some ENR), an accurate understanding of the sediment transport regime with Portland Harbor is critical to ensure progress towards remedy goals and that contaminants from the Site are not removed (eroded) from Site sediments only to be transported and deposited in off-site areas downstream in the Columbia River or Multnomah Channel. Currently, no sediment model has been accepted by EPA and the site record, as well as comments made by EPA, indicate that the Site is largely erosional or transitional (at times erosional or depositional depending on river character). If MNR is to be relied upon as a technology for the remedy, there should be empirical data and multiple lines of evidence that support its selection as an appropriate technology to implement at this, including a better understanding of sediment transport. Given the large uncertainties in existing models and an understanding that the Site is "net erosional", implementation of Alternative G with removal and treatment of more contaminated sediments would ensure a more protective remedy.

EPA Response

EPA did not establish any boundaries of waste in the 2016 feasibility study report (USEPA 2016b). EPA developed estimates of various types of waste based on existing information to estimate costs in the feasibility study. The figures show the extent of the evaluation based on various assumptions identified in the feasibility study report. RAL boundaries and cap designs will be established in remedial design. EPA agrees that additional data collection will be required to determine the appropriate design and waste treatment and disposition requirements during remedial design per the ROD decision tree.

EPA used a robust data set provided by LWG, including sediment data collected as recently as 2013 and fish tissue data collected as recently as 2012, to develop the alternatives in the 2016 feasibility study report. The data set includes 2,259 surface and 975 subsurface sediment samples collected during the remedial investigation to characterize the nature and extent of contamination. EPA does not believe there are any errors or omissions in the CSM and that the information used in the 2016 feasibility study report is sufficient to develop and select a remedial alternative. However, EPA

acknowledges that additional data will be collected during remedial design. These data will be used to support establishing remedial action footprints, technology assignments, use restrictions or other ICs, treatment and disposal of dredged material, mitigation requirements, among others. See also Sections 2.17.3 and 2.26 of this responsiveness summary.

3.2.35 Implement NRRB Recommendation on Performance Monitoring

Comment

The boards' review of the proposed cleanup action resulted in several important recommendations including8: "The boards note that at many large contaminated sediment sites, monitoring plays an important role in remedy performance evaluation." "The boards recommend that the Region address and clarify the role of a monitoring plan in the site decision documents." This recommendation appears to have been overlooked or not included in the proposed plan, and should be included in the ROD.

EPA Response

See Sections 2.17 and 4.1.3 of this responsiveness summary.

3.2.36 Provide Clear Metrics and Monitoring Goals

Comment

Monitoring is an invaluable evaluation tool that can be used to assess the completeness of remedy implementation, remedy effectiveness, and the need for contingency actions. The proposed cleanup plan does not clearly define how Site progress will be evaluated and how compliance with regulatory requirements and cleanup objectives will be measured. Without clearly outlining compliance criteria or metrics, a meaningful assessment of the project progress cannot occur. In addition, if the cleanup does not proceed as expected, there is no contingency plan in place to ensure protectiveness for human health and the environment. The ROD must include more adequate detail on how progress and compliance will be measured. More clear and specific information is needed on interim and long-term metrics, how and where they will be monitored or evaluated, timelines, and contingencies.

- Clear Framework and Metrics: Although, the specific details of monitoring programs are prescribed in project or action-specific monitoring plans, the overarching goals and program implementation should be made more clear in the ROD. The proposed plan does not, but should, explain how monitoring will be integrated into the cleanup process and clearly define monitoring goals or key elements. In addition, more clear metrics on post-construction, interim, and long-term goals during the recovery period are needed. Within the ROD, each monitoring program should be clear it in its goals, process, scaling, metrics, frequency, trigger events, etc. for assessing compliance and meeting project goals.

- Points of Compliance: The identification of areas of attainment or points of compliance are a fundamental component in the design and implementation of monitoring programs to evaluate site conditions for setting baseline values, but also for ensuring that data collected throughout the project is consistent and collected as designed for its intended purpose and in such away to be useful in evaluating progress towards the cleanup objectives. Areas of attainment or points of compliance should be clearly defined for all COCs and all impacted media that support achieving the RAOs within the defined compliance period.

- Upland Sources: The complexity and size of this Site requires careful management and an understanding of the impacts associated with current, on-going, and potential future releases

from upland sources (groundwater, stormwater, bank erosion, overland flow, and overwater acts); the migration of contaminants from upstream sources; and the removal of contaminants to off-site areas in the Columbia River basin. The integration and planning of effective monitoring programs will be a key element to monitoring cleanup progress and should be included in the remedial plan.

- Contingency Actions: Future project decision documents should identify contingencies triggered by threshold criteria, identified action, implementation timeframe.
- Yakama's Role: Yakama has significant concerns about monitoring and expects to participate in development of monitoring strategies for Portland Harbor.
- Example Monitoring Needs by Media Type: Examples of important monitoring programs and target media are summarized in the table below. For example, in-river groundwater plumes should be delineated and monitored in order to evaluate areas of potential recontamination concern and to assess that source control measures are implemented and effective. Fish tissue monitoring will be essential to evaluate progress towards removing Site-specific fish consumption advisories and other ICs that limit the beneficial use at the Site. Surface water quality, upstream loadings, and the downstream migration of contaminants will be fundamental in evaluating impacts from the Site to the Columbia River, impacts from implementation of the remedy, and compliance with ARARs.

EPA Response

See Sections 2.17 and 4.1.3 of this responsiveness summary.

3.2.37 Provide Acceptance Criteria for Caps and Daily Cover

Comment

The ROD must outline acceptance criteria that meet the PRGs, applicable ARARs for all contaminants, and construction quality criteria for imported cap and daily cover materials.

EPA Response

Final cleanup levels for all COCs and all applicable ARARs (including action specific) are contained in the ROD. Construction quality assurance criteria for cap/residual layer placement will be identified during the remedial design phase of the project.

3.2.38 Specify PCB Analysis Methodology

Comment

PCB criteria (RALs and PRGs) are stated in the proposed plan; however, the methodology is not specified. The ROD must specify that for all media PCB analysis should include all congeners, and not simply aroclors. The aroclor analysis does not include all congeners, has higher detection limits and therefore is under-representative of risk. The advantages of congener analysis are that data are more representative of site conditions and therefore more useful for understanding toxicity, risk, weathering, biotransformation, causation, as well as fingerprinting sources. We understand there are reasons to include aroclor analysis such as outdated Clean Water Act water quality criteria. This is an example of how science has evolved and improved, but regulations have not kept up. If aroclor data are needed for certain media, it should be in addition to congener analysis and not in place of it.

EPA Response
Refer to LSS Dispute Issue 6 (Appendix A of this document) of this responsiveness summary.

3.2.39 Conduct an Environmental Justice Analysis

Comment
An environmental justice analysis of the Portland Harbor Site has been completely overlooked (see 2014 Duwamish ROD, sections 6.1, 10.3.3, and 13.2.8) and should be conducted.

EPA Response
See Section 2.35 of this responsiveness summary.

3.2.40 Use Upstream to Downstream Cleanup Sequence

Comment
In past conversations with EPA, management indicated that cleanup would be sequenced in the order in which responsible parties were willing to cooperate. We strongly urge remedy implementation to be sequenced so that dredging is conducted starting at the upstream end and working downstream in order to prevent recontamination.

EPA Response
Where possible, remedial action would be sequenced by area, generally moving from upstream to downstream where possible, capping/dredging contaminated sediment, before moving on to the next area. The actual remedial action sequencing would be developed during remedial design phase of the project.

3.2.41 Clarify Use of Waivers

Comment
The ROD must clarify how, under what circumstances, and at what point in time a waiver of ARARs may be considered. For example, a use attainability analysis or other evaluation supporting a technical impracticability waiver.

EPA Response
See Section 2.3 of this responsiveness summary.

3.2.42 Follow NRRB Recommendation to Define Recovery Timeframe

Comment
The boards' review of the proposed cleanup action resulted in several important recommendations that were overlooked or not included in the proposed plan, and should be included in the ROD.

The board recommended that EPA Region 10 (the Region) "clearly communicate to the local community and other stakeholders the anticipated timeframe needed to carry out the cleanup's active phases, including the time needed to undertake the remedial design and the remedial action phases, and to clearly describe the anticipated recovery time needed after completion of the selected remedy's active phase, such time as the time aquatic receptor tissues will need to recover."

EPA Response
See ROD Section 14.2 and responsiveness summary Section 2.21.

3.2.43 Clarify the Five-Year Review Schedule

Comment

The ROD must clarify the schedule for five-year reviews. For example, we understand these reviews can vary beginning 5 years after construction starts or ends. In the case of Portland Harbor, a construction period of 7 years or longer justifies the need for a more formal evaluation(s) during construction to help understand how effective the cleanup is and, if needed, adjust the cleanup design or construction strategy. Five-year reviews should include an evaluation of the need to implement new sediment remediation technologies to assist in the further reduction of Contaminants of Concern in sediments, surface water and/or fish tissue (ex. Duwamish 2014 MOA).

EPA Response

Following construction, there will be long-term monitoring until the cleanup goals are achieved and beyond. Monitoring will be conducted for pre-remedial design and remedial design. In addition, the first five-year review will take place five years after the start of construction. Also, see Section 2.17.3 of this responsiveness summary.

3.2.44 Provide a Contingency Plan

Comment

Given all the uncertainties, the remedy selected should include appropriate contingency measures. EPA's Contaminated Sediment Remediation Guidance for Hazardous Waste Sites10 states that contingency measures should be included as part of a MNR remedy when there is significant uncertainty that the remedial action objectives will be achieved within the predicted time frame. For example, new technologies can be incorporated into an explanation of significant difference or ROD amendment after the ROD is issued, based on five-year reviews. EPA has authority to alter the remedy even if the change or associated cost increase differs substantially from the ROD. See NCP at 40 CFR § 300.435(c)(2).

In light of the multiple layers of uncertainties associated with Alternative I, the ROD should identify the contingencies that will be implemented if an alternative is not achieving the interim risk targets and not recovering towards RAOs after implementation at an adequate rate. This should be included in what is to be provided to the public for review, along with a clear timeline and criteria for the decision to move forward with a contingency plan. Additional contingencies could include increased dredging, in-situ remediation, ENR, source control, new remediation technologies, etc. We suggest a timeline of 10 years post cleanup construction (ex. Duwamish ROD) for making decisions regarding the need for contingencies. Robust monitoring would be needed to evaluate site conditions and recovery rates.

EPA Response

See Section 2.17 of this responsiveness summary.

3.2.45 Provide Rationale for Using RM 16 as Background

Comment

Background sediment samples collected at river mile 16 (RM 16) are located in close proximity to a known PCB source (a waste water treatment plant per conversation with EPA). DEQ has also summarized data gaps and source control needs for inputs upgradient of the Site. EPA has stated that they will continue to pursue evaluation of anthropogenic background values at RM 16, despite influence by known and ongoing sources, yet has failed to provide information on the problems and

uncertainties associated with background values in the proposed plan. The ROD must include a transparent written and visual description of upgradient sources and rationale for their decision to continue using RM 16 to establish background based cleanup levels. Background anthropogenic sources should also be addressed in regional source control efforts.

EPA Response
See Section 2.17.6 of this responsiveness summary.

3.2.46 Include NRRB Recommendation for Source Control Management in ROD

Comment
The boards' review of the proposed cleanup action resulted in several important recommendations11 that were overlooked or not included in the proposed plan, and should be included in the ROD. "The boards recommend that the Region work with the state to establish a timeline for upland source control of contaminants to the Willamette River so that upland remediation can take place before or at the same time as in-river treatment and dredging/capping of river sediment. The boards further recommend that the Region work with the state to ensure that surface water/groundwater discharged into the river from all of the more than 100 contaminated upland locations meet the relevant maximum contaminant levels. In addition, the boards recommend that the Region consider including in its decision documents clear criteria for evaluating when source control is sufficient to start remedial action, and that EPA continue to work with the state to ensure that source control actions are completed in a timely fashion. The boards also recommend that the Region consider whether undertaking source control actions using CERCLA or other federal authorities might be appropriate to ensure the EPA-selected remedial action's integrity."

EPA Response
The selected remedy relies on the adequacy of DEQ's source control to achieve cleanup levels and RAOs and to prevent recontamination of the Site. It is EPA's expectation that DEQ's upland source control actions will adequately address groundwater contamination (the plumes). The cleanup of known or potentially contaminated upland sites is tracked in DEQ's Environmental Cleanup Site Information database, which is available online at http://www.deq.state.or.us/lq/ECSI/ecsi.htm, and source control efforts are summarized in DEQ's Portland Harbor Upland Source Control Milestone and Summary Report (http://www.deq.state.or.us/lq/cu/nwr/PortlandHarbor/jointsource.htm). Source control continues to be a separate requirement for this project. EPA is actively participating with DEQ on source control efforts. Also, please see Section 2.27 of this responsiveness summary.

3.2.47 Address Upland Source Control Needs

Comment
Upland Source Control remains uncontrolled without a clear plan on when it will be implemented. Within the ROD, EPA must provide greater transparency and directives regarding the progress and effectiveness of upland controls, as well as a summary of data gaps, source control needs, and strategy.

Source control is jointly tackled by multiple agencies including EPA, DEQ, and City of Portland, with the 2005 Portland Harbor Joint Source Control Strategy document12 guiding efforts. This plan should be updated as soon as possible, and should continue to be updated periodically. New information and changes in sources have undoubtedly occurred in the past 11 years, and the prioritization of sites, as well as the source control framework and strategy needs to be re-evaluated.

The most recent and comprehensive source control summary was prepared by DEQ in 2016. Although progress has been made, this document has identified an overwhelming number of unresolved data gaps and source control needs surrounding the Site, as well as upstream. The DEQ implementation of upland source control remedies is intended to eliminate, control or minimize all sources of contaminants from on-going and future discharges of stormwater, groundwater, soil erosion, and other direct sources to the Portland Harbor Site. With respect to upland cleanup sites, DEQ's management of Portland Harbor is currently primarily a voluntary process and many of the cleanups appear to be interim (partial cleanups), rather than final actions. DEQ does not seem to be effectively utilizing its removal authority to require immediate design and implementation of permanent source control measures prior to implementation of the remedy at the Site. Many sites have documented uncontrolled sources, investigations only partially completed, or property owners who have never responded to site assessment requests.

Currently, there are numerous upland sites with moderate or high recontamination potential for the Portland Harbor cleanup. All of the sites listed in the table below have current, on-going, uncontrolled releases to the lower Willamette River. In addition to these sites, DEQ has identified numerous facilities or areas where releases are suspected but investigations have not been completed.

If the DEQ cleanup program remains voluntary and control of these sites is not completed once the sediment remedy is implemented, the risk for recontamination of sediments through unmitigated groundwater, stormwater, and other direct discharges to the river remains high. The ROD needs to provide a clear timeline and strategy for how EPA and the state will apply their collective authorities at these state-lead upland suspected or confirmed cleanup sites that impact Portland Harbor where investigations and cleanups are not moving forward adequately (or not at all in some cases). There are also several recalcitrant federal cleanup sites where EPA needs to become more involved (ex. US Moorings and US Navy).

The proposed plan provides very little information on cleanup of upland river bank and groundwater sources to Portland Harbor sediments. It appears, but is not completely clear, that the proposed plan may be deferring this work to the state. However, in their 2016 summary report, DEQ has deferred the selection of river bank erosion source control measures, mitigation designs, permitting, and overall implementation to EPA. The ROD needs to require a more comprehensive cleanup of river bank and groundwater plume contamination, as well as provide transparency and clarity on how EPA and the state will address these media and how ROD criteria will apply to these sources. Baseline monitoring should include an investigation of areas with suspected contamination that have not been adequately investigated to inform cleanup design.

EPA needs to clarify how the ROD and other specific efforts will address the numerous other upland contaminant source control needs and data gaps that need to be addressed, including floodplain soils, stormwater discharges, groundwater seeps, combined sewer overflow (CSOs), railroads, and federal, city, DOT, port and county facilities or discharges not necessarily under DEQ purview. Also of concern is the fact that configurations of the Big Pipe construction make it difficult to trace pollutant load from a specific source area to a discharge point.

There has been no commitment from EPA to take enforcement actions or to use its authority to compel cleanups for upland sites that currently impact the quality of water and sediment in Portland Harbor. The proposed plan does not address the transmission of contaminants from sites where source control actions are not completed by DEQ prior to the implementation of the Portland Harbor

cleanup. If source controls are not implemented, continuing transport of contaminants will diminish the overall effectiveness of any remedy EPA implements.

The ROD should identify milestones for the upland source control work based on the in-river remediation schedule that triggers intervention by EPA in the upland source control remediation efforts. This timeframe should be identified so that EPA has adequate time to implement actions to address source control issues prior to adjacent or downstream in-river work.

EPA Response
Refer to Section 3.2.46 of this responsiveness summary.

3.2.48 Prevent Recontamination

Comment
Based on the population density and types of activities surrounding Portland Harbor, as well as upstream, future re-contamination is a certainty. The ROD needs to address how recontamination will be handled; clarify roles of federal, state, and local programs in addressing recontamination; and begin developing the framework for a monitoring program that will inform source control efforts on where recontamination is coming from (ex. upland sources, in-river transport of sediments, etc.). EPA has a continued role in source control and prevention and cleanup of recontamination and cannot shift this responsibility entirely to the State of Oregon.

EPA Response
Please see Sections 2.17, 2.27, 2.37, and 4.1.10. Per the ROD decision tree and design elements, river banks within SMAs will be evaluated for their recontamination potential. In addition, river banks outside of the SMAs will be evaluated by DEQ for recontamination potential and potential action. Refer also to ROD Section 14.2.5 and Sections 2.26.2, 2.26.3, 2.26.4, and 4.2.10 of this responsiveness summary.

3.2.49 Develop a Regional Plan for Addressing Contaminants

Comment
The Portland Harbor cleanup should be included in a more comprehensive approach to addressing the contaminants in the Willamette River watershed by implementing a coordinated multi-program effort using EPA, State of Oregon, and local authorities. The cleanup at Portland Harbor is a long-term investment in community and ecological health. In order to sustain a successful remedy that is protective of human health and the environment, EPA should implement a comprehensive and integrated cleanup approach that addresses the complexity of the contaminant challenges. This will require participation of coordinated programs to identify, plan, implement, and monitor activities necessary to ensure compliance with environmental laws and regulations. This is of particular importance to ensure that sources within and upstream of Portland Harbor do not cause recontamination of the Site or otherwise diminish the efforts to remediate Portland Harbor.

The ROD should include a means for assuring that these sources will be cleaned up. In addition to the ROD, on a region-wide scale additional use of existing Clean Water Act authorities for TMDLs, discharge permits, and enforcement actions must be considered. For example:

- Develop an integrated watershed management plan with subwatershed approaches to return the Willamette River to a status of health.

- Particularly focus is needed for contaminants such as DDT, DDE, PCBs, and PAHs that are causing 303(d) impairment of water and for which currently there is neither a TMDL underway nor a process to delist.
- Implement a Willamette River basin-wide TMDL.
- As a pre-cursor to a TMDL, consider the benefits of implementing a Willamette River basin-wide Pollution Loading Analysis to help evaluate the cumulative effects of pollution, aid in identifying sources and their relative contributions, and help prioritize upland source control efforts (ex. Green-Duwamish Watershed pollution loading analysis.
- Consider updating state NPDES permitting requirements. For example, see recent Washington Department of Ecology proposal to modify the Phase I Municipal Stormwater Permit to include requirements for Seattle to adaptively manage their municipal stormwater discharges to the Lower Duwamish Waterway, as well as their updated Industrial Stormwater General Permit (ex. more frequent cleaning and sampling of process lines).
- Revisit the 2009 EPA study14 recommending the following for the Columbia River Basin, which includes the Willamette River basin: (1) expand toxics reduction activities; (2) identify, inventory, and characterize the sources of toxics in the basin; (3 & 4) develop regional, multi-agency long-term monitoring and research programs; (5) develop a data management system that will allow us to share information on toxics in the basin; and (6) increase public education about the toxics problems and resource needs.

EPA needs to make a commitment, on a multi-program level, to ensure the long-term success of the Portland Harbor cleanup, reduce contaminant inputs to the Willamette River, prevent Site re-contamination, and restore the health of the Willamette River to its beneficial uses. This commitment must involve collaboration with state and local partners, tribes, and public interests. The Yakama Nation expects to be an active participant in the development of a regional plan.

EPA Response

In addition to addressing contamination at the Site, EPA recognizes that Portland Harbor is only a small part of the greater Willamette River watershed system. EPA anticipates working with DEQ to develop a comprehensive strategy for identifying and addressing additional sources of contamination to the selected remedy. This effort will include consultation and coordination with tribes, the community, local government, and other interested parties. Refer to LWG Dispute Issue 1g (Appendix A of this document).

EPA will continue the working relationship established under the 2001 MOU for tribal government input to ensure that their concerns and interests are considered whenever EPA actions may affect tribal interests.

3.2.50 Do Not Use Roosevelt Landfill

Comment

Yakama Nation requests that EPA consider landfill options outside of Yakama Ceded Lands for disposal of wastes from the Site. The feasibility study indicates that other acceptable landfill options are available which include the Columbia Ridge Landfill (Subtitle D) and Chemical Waste Management (Subtitle C) in Arlington, Oregon. These landfills have adequate capacity; available rail transport, and accept wet waste (Columbia Ridge).

EPA Response
EPA will consider the potential use of any permitted facility (Subtitle D or C) proposed for disposal of dredged material during remedy implementation.

For cost estimating purposes only, the 2016 feasibility study report (USEPA 2016b) assumed Roosevelt Landfill as a representative Subtitle D facility used for disposal of contaminated sediments. Since it is anticipated that responsible parties will implement the remedy, those parties will propose disposal facilities for EPA's approval.

3.2.51 Do Not Use a CDF

Comment
Yakama Nation opposes the use of a CDF at the Portland Harbor Site because high-level contaminated sediments should be permanently removed from the river. The construction of a CDF would destroy an estimated 14-acres of critical, high-value habitat and poses an unnecessary risk for future contaminant releases. Although modeling of the proposed CDF shows concentrations of COCs released from the CDF will be below water quality criteria, the model shows releases of COCs will continue to the Willamette River in perpetuity which may result in further impacts. This seems counter-productive to the goal of cleaning up the Site and achieving the RAOs.

The CDF modeling excludes modeling of the lighter fraction COCs since as stated in the feasibility study, "heavier, more hydrophobic and recalcitrant compounds are expected to have the greatest effect on long-term water quality issues in CDFs." Lighter fractions of the COCs should be modeled since the short-term water quality issues could be greatly affected. In addition, an evaluation of existing technologies that could be implemented that would eliminate the leaching of COCs from the CDF into the Willamette River is lacking and should be discussed. The analysis of the use of the CDF should also include the possible future effects on releases from construction and operation, global warming, flooding, and potential earthquake hazards.

EPA Response
Refer to Section 2.14.1 of this responsiveness summary.

3.3 Confederated Tribes of the Grand Ronde

3.3.1 Select Alternative G

Comment
Of primary concern is that the proposed plan is not sufficiently protective of human health and the environment. Alternative G, while still insufficient in some respects from Grand Ronde's viewpoint, would be far more effective in protecting human health and the environment than the alternative EPA advances in the proposed plan (Alternative I)

EPA Response
Refer Five Tribes' comment responses (3.1.12, 3.1.23, 3.1,25, and 3.1.26).

3.3.2 Continue Engagement with Tribe to Ensure Protectiveness

Comment
Grand Ronde's first priority in terms of the Portland Harbor cleanup is the health and safety of all of its Tribal members. It is unacceptable to the Tribe that Tribal members are at increased risk of harmful effects from contaminants when they eat their traditional foods. The remedy must be sufficiently

protective of human health and the environment, including Tribal members and Tribal cultural resources. As a consulting sovereign nation and a Trustee of natural resources at Portland Harbor, Grand Ronde requests the continued engagement with the Tribe in the cleanup past the ROD and throughout all remedial design, operation, and monitoring phases. The end result of the Portland Harbor cleanup should be that the lower Willamette River supports Tribal cultural resources, and that Tribal members can use and consume those resources at traditional levels without risk of ill effects from exposure to Portland Harbor contamination.

EPA Response

EPA considered numerous factors, such as tribal fish consumption rates and the effects of contamination at the Site on treaty-protected resources, to develop remedial alternatives for the Site. Once implemented, the cleanup will improve fish habitat and help further the tribes' rights to fish. The scope of the CERCLA action is restricted to approximately 10 miles of the Willamette River, but upstream of the Site, background levels of PCBs from "clean" areas exceed the acceptable range based on conservative risk estimates, meaning that even with a more stringent remedy proposed fish advisories would likely remain in effect following the cleanup. Refer to response to comment on background and fish advisories.

Throughout the remedial investigation/feasibility study process, EPA has fostered meaningful engagement with the MOU partner tribes and has encouraged and facilitated Tribal involvement. Consistent with EPA's Policy on Consultation and Coordination with Indian Tribes, EPA also held consultation meetings at tribal council locations from January 12 through February 4, 2016 and from July 19 through July 26, 2016, during the public comment period on the feasibility study report (USEPA 2016b) and proposed plan (USEPA 2016c). In addition, representatives for the Confederated Tribes and Bands of the Yakama Nation met with Administrator McCarthy on July 26, 2016 in Washington, D.C. A summary of the consultation meetings, along with any written materials provided, are in the Administrative Record.

The consultation process also included discussions on treaty rights, as directed by the February 2016 Guidance for Discussing Tribal Treaty Rights, which was issued in order to enhance consultations in situations where tribal treaty rights may be affected by a proposed EPA action. including conducting formal Tribal consultations. Government-to-government consultations occurred in January and February of 2016 in anticipation of the proposed plan.[5] EPA will continue this working relationship for tribal input under the MOU and EPA's Policy on Consultation and Coordination with Indian Tribes, to ensure that tribal concerns and interests are considered whenever EPA actions may affect tribal communities – both related to treaty rights and other impacts. The ROD includes language regarding tribal coordination and consultation and community involvement in all activities post ROD.

The Site is complex and the remedy preferred by EPA to perform an effective cleanup under these complexities will require an ongoing partnership and collective input from both the state and the tribes in communication with EPA, for critical decisions made throughout the implementation of the in-river cleanup.

3.3.3 Review Attached Documents Supporting Alternative G

Comment

Please review the attached technical recommendations and comments showing why Grand Ronde must advocate for, and EPA must select, Alternative G with some additional improvements including assurance that the remedy components can withstand severe flooding and a Cascadia Subduction Earthquake.

EPA Response

Please see Sections 2.6, 2.19, and 2.31 of this responsiveness summary.

3.4 Confederated Tribes of Siletz Indians

3.4.1 Address the Comments Submitted by the Five Tribes

Comment

The Confederated Tribes of Siletz Indians (Siletz Tribe) fully joins in the attached Five Tribes' Comments on EPA's proposed plan for the Site. The Siletz Tribe writes separately to emphasize the importance to its members of a robust and sufficiently protective remediation of the Site.

EPA Response

Comment noted.

3.5 Confederated Tribes of the Warm Springs Reservation

3.5.1 Select a More Aggressive Alternative

Comment

None of the alternatives in the proposed plan and feasibility study meet our vision for cleanup of the Site. Alternative I, the preferred alternative identified in the proposed plan, is concerning because it does not give us confidence environmental and human health risks will be eliminated post 10-years of construction. We do however acknowledge that dredging is not a viable option in all locations and therefore other remedies will need to be employed. This alternative is highly reliant on passive remedial technologies, primarily MNR, ENR, and capping. All of which have associated risks and leave contaminants in the sediment.

EPA Response

Please see Sections 3.1.3 and 3.1.33 of this responsiveness summary.

3.5.2 Do Not Use MNR/ENR in the Most Contaminated Areas

Comment

The application of MNR and ENR does not remove all contamination from the sediments; the performance and outcome is unknown; the dynamic nature of the Willamette River particularly in the face of climate change is not well understood; and long-term costs associate with monitoring these applications for perpetuity exist. The assumption that natural recovery will occur by the movement of clean sediments mixing with contaminated substrate leaves an unacceptable risk particularly since modeling efforts in the Willamette were unable to confidently predict particle movements. Both MNR and ENR should only be used in areas that are known to be depositional or considered neutral. The designation of depositional and erosive area is not always clear in the proposed plan and feasibility

study; therefore, in the remedial design, new data may need to be collected and new technologies assigned as appropriate. In the most contaminated areas, MNR and ENR should not be considered.

EPA Response

Please see Sections 2.16.1 and 2.17.3 of this responsiveness summary.

3.5.3 Use a Minimum Cap Thickness of 16 Inches Instead of 12 Inches

Comment

A significant number of sites have been identified for capping. Capping assumes that partial removal of contaminated sediments can then be topped with various materials to create a protective cover. It will be important to ensure that the appropriate caps are assigned based on the contaminants present, for example, a reactive cap may not be appropriate in areas with metals present. Caps that are predominantly sand should incorporate organic materials to improve their ecological function. The Willamette River is home to the largest individual run of lamprey in the Columbia River Basin. Lamprey are reliant on finding burrowing habitats, and may select areas where capping has been implemented. The addition of organics will not only improve the function of caps but also improve burrowing locations. However, we are concerned that the depths of the caps are not adequate for lamprey. Currently, the proposed cap thickness is 12 inches. We recommend a minimum, total cap thickness of 16 inches to ensure lamprey are not burrowing into contaminated sediments.

EPA Response

Please see Section 3.1.37 of this responsiveness summary.

3.5.4 Clarify Plans for Addressing Groundwater

Comment

It appears in Alternative I, only 33 percent of the groundwater plume will be addressed and remediation plans are only available for 65 percent of the upland areas. This is of concern since these are both pathways for contamination to reach the Site. The proposed plan describes the working relationship and responsibilities between DEQ and EPA within the Site. With few exceptions it is the responsibility of DEQ to address the groundwater plume and upland areas. It is unclear the role of EPA if remedial designs do not adequately address contaminants entering the waterway. Without plans to address these, continued and re-contamination is possible.

EPA Response

Please see Section 2.27 of this responsiveness summary.

3.5.5 Ensure ICs are Used

Comment

Alternative I require majority of the Site to have long-term monitoring, maintenance and a guarantee of funding for perpetuity to ensure their effectiveness. It is important that post de-listing that the commitment of funding and maintenance continues. There are no assurances that MNR, ENR, and capping will perform as expected since contaminated sediments are not being removed completely and there is no long-term information available that suggests their success. Because many of the most toxic contaminants have long aquatic half-lives and will remain in the substrate, ICs will continue to be necessary including fish consumption guidelines and are likely to restrict access to waterways and land use.

EPA Response
Please see Section 2.28.1 of this responsiveness summary.

3.5.6 Reconsider Alternative G

Comment
Alternative G is the only defensible option within the proposed plan and feasibility study; however, it still poses risk. Alternative G is the only alternative that meets EPA threshold criteria of "Overall Protection of Human Health and the Environment" and "Compliance with ARARs".

Alternative G removes the most contaminants. Dredging to remove all contaminated materials should be the largest portion of remedy. Dredging should be considered in all locations over MNR, ENR, and capping; even in nearshore areas. Where non-aqueous state liquids (NAPLs) and PTW are present, dredging should be the technology of choice to eliminate the risk of cap breeching and re-contamination. Further, we are concerned that in areas with the presence NAPLs and PTW, these contaminants, may move through sediments and cause re-contamination. In locations where nearshore structures are present, and dredging does not appear to be an applicable technique, removal of the structure(s) should be considered and completed to the extent practicable. While dredging is the most costly solution, it eliminates the long-term costs associated with MNR, ENR, and caps for perpetuity and eliminates the need for ICs. Additionally, ICs are difficult to enforce and could compromise human health and the environment post-cleanup and de-listing of the Site. Removal of contaminated substrate has the highest environmental, human health, and economic benefit.

EPA Response
Please see Sections 3.1.8, 3.1.12, 3.1.23, 3.1.46, and 3.1.61 of this responsiveness summary.

3.5.7 Ensure Any CDF Is Secure in Perpetuity

Comment
For materials removed during dredging, a confined disposal facility (CDF) could be developed on-site but would need assurances that the containment of contaminated materials would be secured for perpetuity. An off-site CDF also could present risks to both the Willamette and Columbia rivers. To determine a CDF location, EPA should conduct a risk analysis that takes into account: the permanence of containing contaminated sediments; the potential risks or benefits to each location; and characterization of the risk associated with the transport of these materials to the Willamette, Columbia and adjacent communities.

EPA Response
Please see Section 3.1.41 of this responsiveness summary.

3.5.8 Update, Advertise, and Better Educate the Public on Fish Advisories

Comment
Without full removal of all contaminants that affect human health, fish consumption guidelines will not be eliminated for all portions of the consumer population. During the remedial design, Guidelines need to be updated to protect the tribal demographic and include the entire fish not just fillets. Additionally, the fish consumption guidelines need to include migratory species, particularly lamprey and sturgeon, which are likely to spend multiple years within the Site and are known to accumulate toxins based on high lipid content and species longevity. Because fish consumption guidelines are

hard to enforce, greater outreach and education need to be completed including notices in tribal media and in-community presentations.

EPA Response
Please see Section 3.1.49 of this responsiveness summary.

3.5.9 Commit to Engaging the Tribe throughout Remediation

Comment
Continued commitment to communication with the Tribe is essential through the remedial phase. These conversations should include continued engagement through the Trustee Council. This includes any request by the potentially responsible parties to deviate or request flexibility from assigned remedies. We appreciate the government-to-government engagement to date and encourage it to continue with more frequency. We would, however, like to remind EPA that trust obligation includes providing a tribal consultation and ability to comment prior to documents being released to the public for review and comment.

EPA Response
Please see Sections 3.1.55, 3.1.87, and 3.3.2 of this responsiveness summary.

3.5.10 Hold PRPs Accountable and Remedy Damages to Tribal Resources

Comment
We acknowledge the large effort that has gone into the development of the proposed plan and feasibility study. Further, specific comments are attached in a combined memo from the five MOU signing tribal trustees (The Confederated Tribes of the Warm Springs Reservation of Oregon, The Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, the Confederated Tribes of Siletz Indians, and Confederated Tribes of the Grand Ronde Community of Oregon). As proposed, preferred Alternative I, leans toward reduced costs for polluters without a guarantee that cleanup will be successful in the timeframe needed. Alternative G should not have been rejected based on cost to polluters and the period of construction. It appears that the criteria used to determine the preferred alternative is bias toward choosing a mid-level cleanup option by giving deference to an option that has short-term impacts during the construction phase.

The United States has a treaty trust obligation to restore the Site and habitats to protect human health and promote a naturally functioning environment where traditional practices continue, knowledge can be passed to future generations and provide healthy, harvestable populations of culturally significant species for perpetuity.

We expect EPA to hold the responsible parties accountable and use enforcement as necessary to remedy damages to tribal resources by:

- Completing cleanup in a reasonable timeline of 10 years post-construction;
- Removal of contaminated sediments by dredging at all practicable locations with less reliance on MNR, ENR. and capping;
- Elimination of fish consumption guidelines for all fishes within the Portland Harbor;
- Development of a monitoring plan with appropriate deliverables and timelines;

- Commitment from the United States government that post de-listing of the Site, monitoring, maintenance and associate funding will continue to ensure the permanence of remedial actions; and,
- Continued communication, at all levels, with the Warm Springs Tribe.
- Threats to treaty reserved rights and human health need be taken into account during the development of the Record of Decision and remedial designs.

EPA Response
Please see Sections 3.1.2, 3.1.12, 3.1.26, 3.1.46, 3.1.55, and 3.1.86 of this responsiveness summary.

3.6.1 Nez Perce Tribe

3.6.1 Let Long-Term Protection of Human Health and the Environment Drive the Remedy Decision

Comment
The Tribe has an interest in ensuring that the cleanup of the lower Willamette River is based in the best available science in order to achieve lasting protections of ecological and human health. The Tribe strongly believes that long-term protection of human health and the environment should drive the remedy decision. We have communicated this position to EPA several times over the course of our partnership and during government-to-government consultation. Unfortunately, we feel that EPA's proposed plan fails to ensure the long-term recovery of the lower Willamette River to conditions that support natural resources and the continuation of our cultural heritage and activities that rely upon the river and its habitats

EPA Response
EPA has revised its preferred alternative to Alternative F Modified. Alternative F Modified relies on application of the same remedial action levels (F RALs) throughout the Site with the exception of the navigation channel where the remedy will target PTW and sediment contamination exceeding the Alternative B RALs. Due to differences in water depth, sediment transport potential and exposure potential the use of higher RALs in the navigation channel is justified. This modification will address the majority of the comments as it does take more active steps to ensure a faster long-term recovery of the Lower Willamette River. Please also see Sections 3.1.12 and 3.1.22 of this responsiveness summary.

3.6.2 Select a Remedy That Meets Threshold Criteria

Comment
The Tribe cannot support EPA's Plan because, even by EPA's own measure, the preferred alternative fails to meet the two threshold criteria of overall protection of human health and the environment, and compliance with ARARs. To address uncertainties in natural recovery, EPA applied an "interim target" approach to evaluate whether efforts will be effective to meet cleanup goals. The Tribe does not believe that EPA has adequately justified the selection of interim targets. Even if the interim targets were justified and appropriate, EPA's preferred alternative meets those interim targets for only 2 of the 9 cleanup goals. We do not understand EPA's conclusion that its preferred alternative will be protective of human health and the environment when it does not even meet most of the interim targets.

EPA Response
EPA has revised its preferred alternative to Alternative F Modified. Alternative F Modified further reduces the reliance on MNR, and thereby accelerates the pace at which clean up goals may be achieved. Please also see Sections 3.1.12, 3.1.22, 3.1.23, and 3.1.24 of this responsiveness summary.

3.6.3 Do Not Focus on Short-Term Impacts

Comment
The Tribe believes that EPA's decision to select Alternative I is based on a value judgment of the relative importance of short-term construction impacts and cost compared to long-term protection of human health and the environment. In evaluating short-term effectiveness, EPA weighed only the construction impacts of each alternative, but not also the impacts at the Site that will continue to occur and accrue until the Preliminary Remediation Goals are achieved. This approach, coupled with a comparison method that is skewed toward selecting a "middle" remedy, undercuts the purposes of CERCLA to permanently and significantly reduce the dangers associated with releases of hazardous substances.

EPA Response
Please see Sections 3.1.12 and 3.1.27 of this responsiveness summary.

3.6.4 Use Conservative Estimates for Recovery and Focus on Removal

Comment
Due to the complexity of the river's hydrology and the uncertainty about natural recovery, EPA should utilize the most conservative estimates for natural recovery processes and adopt a remedy that will focus on removal of contamination. While capping may be less expensive in the short-term, caps require long-term maintenance and monitoring. Those additional costs and risks of failure should not be discounted in identifying the most effective remedy for long-term protection of human health and the environment. Further, in order to ensure effectiveness of the remedy, EPA must include a robust and specific monitoring and reporting plan that will identify decision points for determining progress and results that will trigger additional actions.

EPA Response
Please see Sections 3.1.3, 3.1.4, 3.1.11, and 3.1.12 of this responsiveness summary.

3.6.5 Eliminate the Need For Fish Consumption Advisories

Comment
Tribal members rely on fish (both resident and migratory) for our diet at much higher rates than the general population. Tribal fish consumption is already suppressed due factors such as decreased fish populations resulting from habitat modifications and pollution, and loss of access to traditional tribal fishing sites. Therefore, fish consumption advisories are not an acceptable solution to the Tribe. After 7 years of construction, EPA estimates that fish consumption advisories would allow for approximately 50 fish meals every 10 years. This fish consumption rate is significantly lower than the tribal fish consumption rate of 1,380 resident fish meals per 10 years used in the Baseline Human Health Risk Assessment. EPA must do more to ensure that future generations of Tribal and community members can safely eat all species of fish from the lower Willamette River.

We also believe that EPA must do more to evaluate effects on migratory fish species. Pacific Lamprey is an important species to the Tribe. Currently, Willamette Falls is the only place where the traditional

lamprey harvest continues. Lamprey ammocetes spend years burrowed in sediment and therefore ate likely exposed to more Site contamination than other migratory fish.

The Treaty of 1855 guaranteed to the Tribe the right to take fish "at all usual and accustomed places in common with citizens of the Territory." The Tribe would not have signed this treaty without these assurances that our right to fish would be protected into the future. The Nez Perce have held this inherent right to take fish since time immemorial. But a right to fish that is constrained by the inability to consume the harvest because fish are too contaminated to safely eat is like no right to fish at all.

EPA Response

Please see Sections 3.1.7, 3.1.12, 3.1.45, and 3.1.46 of this responsiveness summary.

Section 4

Oregon Department of Environmental Quality Comments and Responses

4.1 Overall Comments

4.1.1 Ensure Protection by Issuing a Final Decision and Initiating Cleanup Quickly

Comment

Contamination levels in some specific areas of the Harbor pose a very real threat to the health of people and families consuming resident fish and shellfish – such as carp, smallmouth bass, catfish, and crayfish – caught in those areas. High levels of contamination in these key areas also pose very significant risks to the ecosystem, including the wildlife, fish, and benthic organisms that rely on this water body. After 16 years of study, we strongly urge EPA to issue the ROD, subject to state concurrence, and begin cleaning up these areas quickly so that the river can be fully returned to its historic role as the cultural, social and economic hub of the City of Portland.

EPA must stick to the current schedule of issuing a ROD in 2016 to avoid a potential cascading series of delays. Delays could result from anticipated changes in EPA administration, growing concerns with the age of the remedial investigation data and – if new data are collected – the need to update the remedial investigation, human health and ecological risk assessments, and feasibility study. The possibility of a major delay at the expense of the health of the river, the community, and the regional economy is simply unacceptable to the state. We acknowledge that some significant project uncertainties remain; however, this is not unusual with large, complex sites. These uncertainties can and should be addressed during remedial design and factored into EPA's long-term strategy for monitoring, reporting, and incorporating adaptive management, as needed, to achieve a protective remedy.

The state encourages EPA to increase efforts in planning for timely implementation of the ROD, with a goal to complete construction within ten years following issuance of the ROD – a timeframe which is in line with the construction duration specified in the proposed plan (USEPA 2016c). Cleanup of the key areas of the Harbor which pose the greatest risks will not happen by itself. Only with a well thought out plan for how to begin work now and encourage responsible parties to participate can we succeed in making the Harbor safe for all of our communities within a reasonable time period.

A successful implementation framework will require the following key elements:

- A mechanism for the Site to be broken into smaller and more manageable work areas (i.e., sediment management areas, SMAs) so that areas posing the highest risks can be addressed sooner.
- Additional data to determine current baseline conditions, more accurately estimate future remedial design and remedial action costs, and support the allocation process. These data can be collected concurrent with remedial design, and should not delay remedy implementation.

- Incentives for responsible parties to enter into remedial design and/or remedial action agreements with EPA to expedite cleanup of SMAs.
- Partnerships with federal, tribal, state and local entities, under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Partnerships help ensure that government entities have adequate resources to oversee simultaneous cleanup of multiple work areas, resulting in a cleanup that is faster and more effective than would otherwise occur. When establishing partnerships, carefully delineate EPA and DEQ's roles for overseeing the various aspects of ROD implementation.
- Options for managing the site-wide area outside of the SMAs. This may include encouraging the responsible parties to establish and contribute to a remediation trust.
- Clarity regarding EPA's intended enforcement approach. Creating a framework for increased certainty will increase the likelihood that there will be a critical mass of performing parties.

EPA Response

EPA appreciates DEQ's comprehensive review of the feasibility study report (USEPA 2016b) and proposed plan (USEPA 2016c) and the state's valuable input. EPA agrees with DEQ that contamination levels in the Site pose a very real threat to the health of people and families consuming resident fish and shellfish and also pose very significant risks to the ecosystem, including the wildlife, fish, and benthic organisms that rely on this water body. EPA also shares the goal of timely construction of the final remedy to achieve the final cleanup goals within a reasonable timeframe. As DEQ indicates, significant remedial design sampling will be required to update existing information to design the cleanup. Early in that process, EPA will collaborate with the various federal, tribal, and state partners. During this planning process, EPA will coordinate remedial actions at the Site with all the stakeholders and support agencies consistent with the MOU to expedite efficient cleanup in river, upriver, and in upland areas. MOU partners will be coordinated with per the MOU framework.

As DEQ is aware and has concurred with, EPA has selected Alternative F Modified as the selected remedy. The construction timeframe for the remedy is 13 years, so it is unlikely that construction will be completed ten years from issuance of the ROD. However, EPA expects that the cleanup work will be conducted by the PRPs under CERCLA agreements with the most expeditious timeframe possible so as to better protect human health and the environment in a timely fashion. EPA will encourage the PRPs and contractors to hire locally but cannot require parties to do so. However, EPA's contractors have federal contracting goals related to the use of minority, women, veteran, and small business subcontractors and strive to use these firms whenever possible. Additionally, at large Superfund sites like Portland Harbor, EPA is often able to provide free training through the SuperJTI to train and help place local residents in cleanup-related jobs. If funding becomes available and the community expresses a desire for such training, EPA could work to make the SuperJTI training available. For additional detail or information go to https://www.epa.gov/superfund/learn-about-superfund-job-training-initiative#tab-5.

Specific comments regarding potential post-ROD enforcement or negotiation issues are not related to the selection of a remedy and will not be addressed in this responsiveness summary.

4.1.2 Address Environmental Justice through Early Action

Comment

Despite existing fish advisories, people – particularly low income, people with limited English proficiency, houseless, and other communities with environmental justice concerns – continue to rely on fish from Portland Harbor as a primary food source. These communities are most at risk for adverse health effects. Avoiding further delay in cleaning up the most contaminated areas of the Harbor and moving forward with implementation now is a matter of environmental justice.

The highest concentrations of the key risk drivers –PCBs, PAHs, dioxins/furans and organochlorine pesticides (DDx) – are present in up to 13 "hot spots" (i.e. SMAs) within Portland Harbor. These contaminants pose the greatest risk to people who eat resident fish and shellfish – such as carp, smallmouth bass, catfish, and crayfish – caught from these areas. At construction completion, EPA's proposed Alternative I is estimated to reduce the human health risks from eating fish by as much as 100-times when compared to current levels1. Further risk reduction of the lesser contaminated areas will occur over the coming decade(s) as monitored natural recovery takes place, primarily through burial from upriver sediment loads and chemical breakdown.

Acknowledging that cleanup of the "hot spots" will not eliminate all health risks and that many decades are likely needed for monitored natural recovery to be fully effective over the remainder of the Site, a plan is needed to protect affected communities now.

A comprehensive update of the existing fish advisories must be implemented as soon as possible following issuance of the ROD, enhanced as new information becomes available, and must remain in place until remedial action objectives are achieved. In addition, the remedy must include active and effective community outreach and education, along with continued monitoring and reporting to the public and affected communities.

An effective early action and community outreach plan should include:

- Prioritizing the timing of remedial actions, so that high use fishing areas, publicly accessible shoreline, and high value natural resource areas are cleaned up as early as possible.
- Providing increased funding and resources for outreach programs, particularly for community-based organizations with connections and expertise needed to conduct culturally-responsive education.
- Providing increased funding and resources for monitoring and regular reporting to both the general public and to specifically targeted communities, including tribes, known to rely on the Harbor as a food source.
- Clarifying the roles of EPA and Oregon Health Authority in developing and implementing fish advisories.
- Establishing clear timeframes for implementing and monitoring fish advisories, and correcting inconsistencies within the feasibility study and proposed plan.

EPA Response

EPA agrees that all areas that provide recreation, fishing or other public uses, including high-use areas such as beaches and fishing areas at Cathedral Park, Willamette Cove, and Swan Island Lagoon, should be given priority in the timing of the cleanup to limit direct contact exposure quickly as possible. During the planning and execution of the remedial design, EPA will consider site-specific factors further, including high public use, in sequencing cleanup.

EPA recognizes that fish consumption advisories are more effective with community support. EPA has conducted extensive outreach efforts, including coordinating with the Oregon Health Authority, DEQ, and the City of Portland to inform particularly vulnerable communities of risks associated with contamination in the river and to discuss city/state services that may be available to assist them. Additionally, EPA has engaged with many different groups over the years, including groups that represent or are concerned about communities with environmental justice concerns. Some of the main groups that EPA has engaged with include Communities of Color, Native American Youth Association, Latino Network, Right 2 Dream Too, Right 2 Survive, Willamette Riverkeeper, the Slavic Immigrant Association, Ecumenical Ministries Oregon, the Coalition of Black Men, the Oregon Environmental Justice Task Force, Oregon Tradeswomen, League of Women Voters, Verde, Portland Harbor Community Coalition, Sierra Club Portland, Occupy St. Johns, Audubon Society, Asian Pacific American Network of Oregon, Vietnamese Community of Oregon, Portland neighborhood associations and schools. EPA will continue to work with these groups and other interested parties to make sure that future outreach efforts reach historically underrepresented communities.

During remedial design, consistent with EPA Superfund guidance on ICs, EPA will look to the PRPs to develop an ICs implementation and assurance plan that lays out the approach for the development and implementation of ICs, including fish consumption advisories and timeframes. The primary goal of the plan is to establish and document the activities necessary to implement and ensure the long-term stewardship of ICs, and specify the persons and/or organizations that will be responsible for conducting these activities such that the roles of EPA, Oregon Health Authority, and others are well understood. In development of the plan, coordination with river users, property owners, communities and other stakeholder groups will be sought with a goal to minimize the negative long-term impacts of ICs as part of the remedial action.

EPA will continue outreach and education efforts tailored to the affected communities to ensure that fish consumption advisories are effective and appropriate, advisory signs are designed, installed, and maintained effectively and at the appropriate locations, in coordination with Oregon Health Authority, Multnomah County Department of Health, and the City of Portland. In addition, based on long-term monitoring as determined in the five-year review process required under CERCLA, fish consumption advisories will be re-evaluated to ensure they are fully protective but not overly restrictive and on target to meet long-term goals of the remedial action. This may include special consideration of high use areas such as beaches and fishing areas at Cathedral Park, Willamette Cove, and Swan Island Lagoon. Additional information on ICs is provided in Section 2.28 of this responsiveness summary.

4.1.3 Evaluate MNR Effectiveness in Detail after the ROD

Comment

The proposed plan identifies monitored natural recovery as the primary remedy for areas of the Site that are outside of the active sediment management areas (approximately 85 percent of the Site). Monitored natural recovery is relied upon to reduce site risks and achieve project remedial action objectives over time, including a period of time after construction completion. The effectiveness of

monitored natural recovery is highly dependent on clean sediments suspended in the water column that enter the Site from upriver. Water column data collected during the remedial investigation by LWG and others indicate that monitored natural recovery is unlikely to achieve risk-based protective levels for PCBs without additional measures being taken upriver of Portland Harbor.

DEQ oversaw sediment cleanup actions in the "Downtown Reach" of the Willamette river – the four-mile reach immediately upriver of Portland Harbor – beginning with the Portland General Electric Station L site in the late 1980s. Additional cleanup actions included Ross Island Lagoon, Zidell, and Portland General Electric River Mile 11.5 East. DEQ expects that remedial actions at two other sediment sites will be completed in summer 2017 or 2018: the Former Portland Gas Manufacturing Plant at the north end of Tom McCall Waterfront Park conducted by Northwest Natural, and a PCB contaminated site on the east end of the Hawthorne Bridge conducted by Portland General Electric. Comprehensive sediment investigations by the City of Portland, DEQ, and others between 2009 and 2010 and fish tissue samples collected by LWG in 2012 have revealed potential data gaps and indicate that more investigations are necessary to confirm that the Downtown Reach will not limit the effectiveness of monitored natural recovery in Portland Harbor. DEQ will increase its efforts working with potentially responsible parties and stakeholders to expeditiously complete this important work.

DEQ is also assessing the health of the Willamette River watershed and the attainment of state ambient water quality standards, which are some of the most stringent in the country. This includes comprehensive sampling of co-located sediment, water, and fish tissue for PCBs and other contaminants throughout the Willamette River watershed and parts of the Columbia River.

The elements of a comprehensive monitoring plan should include:

- A description of how EPA will assess the effectiveness of monitored natural recovery following issuance of the ROD in consideration of improvements in Downtown Reach sediment quality, better information on watershed health, post-ROD baseline data, and long-term performance monitoring.
- Collaboration with DEQ's cleanup and water quality programs, EPA's CERCLA and water quality programs, tribal and local governments and other stakeholders to develop an approach for assessing performance of the in-river remedy, loading from upriver sources, and the effectiveness of source control measures.
- A process for evaluating and implementing corrective actions, as needed, for managing downstream transport of site contaminants through engineering and turbidity controls, construction monitoring, and site-wide monitoring.

EPA Response

EPA will be monitoring and commenting on DEQ activities both upriver and upland to ensure that this work is compatible with the cleanup work being undertaken as part of this ROD, and to determine if further action upland or upriver is necessary. EPA agrees that a comprehensive monitoring plan will be required and will coordinate with DEQ, tribal and local governments, and other stakeholders on its development after the ROD and during the remedial design. Section 14.2.7 of the ROD describes the significant baseline sampling that will be undertaken to update existing information and to design the cleanup. Baseline sampling will include areas upstream and downstream of the areas that are the subject of this ROD.

During active remediation activities (such as dredging, capping, placement of clean sediment for ENR) there will be monitoring in the construction area as appropriate. The cleanup activities performed in the river will need to comply with water quality standards near where the activity is taking place. Air samples may be collected to make sure contaminants do not exceed worker health-based concentration levels in air as well as ensuring unacceptable levels are not leaving the work area. If contaminant levels exceed water or air quality standards, the work will be modified, and additional controls will be taken as needed. In addition, collection of sediment, surface water, pore water, and fish tissue samples will be collected during the construction period.

Following construction, there will be long-term monitoring until and after the cleanup goals are achieved (ROD Section 14.2.7). The long-term monitoring program will at least include sediment and tools to monitor sediment movement, such as sediment traps, river banks, surface water, pore water, and fish tissue samples from upstream, within, and downstream of the Site. Passive samplers may also be used to supplement fish tissue data as a surrogate for fish tissue, as well as a tool to achieve lower detection limits in monitoring the water column. Data on contaminant levels will be used for multiple purposes, such as to determine if natural recovery is taking place as expected or if any additional actions are required to achieve the cleanup goals on the planned timeline; track if fish tissue concentrations are decreasing; and monitor if the caps are effectively containing the contaminated sediment and/or groundwater. Data on contaminant levels in fish tissue will also help inform when and how the fish consumption advisory or other restrictions could be relaxed.

Long-term monitoring will include regular inspections of the sediment caps to make sure they are in the proper place, have the required thickness and type of capping material, are achieving RAOs such as pore water standards, and are functioning as intended. Cap inspections may also be required after natural events such as earthquakes or floods, and manmade events such as boat collisions or violations of land use restrictions. Monitoring and maintenance of the caps would be required in perpetuity. Refer also to Sections 2.17.3 and 2.27.1 of this responsiveness summary.

4.1.4 Aggressively Clean Areas Posing Risk to the Benthic Community and Lamprey

Comment

As referenced in the proposed plan, the EPA-approved BERA (Windward 2013) found that unacceptable risks to benthic invertebrates are located in approximately 4-8 percent of the Harbor; however, the feasibility study (Figure 4.1-1) incorrectly identifies approximately 60 percent (1,289 acres) of the Harbor as having unacceptable benthic risk. The area presented in the feasibility study was defined using the lowest of contaminant-specific toxicity reference values (TRVs) from the risk assessment as PRGs in sediment. This area is much larger than the benthic risk area predicted by site-specific models used in the BERA (the Floating Percentile Model and Logistic Regression Model) and does not include some areas which were predicted in the BERA to have moderate to high toxicity to benthic organisms. The state recommends a revised approach which would remediate all sediment areas of unacceptable benthic risk at construction completion, thereby protecting lamprey ammocetes that occupy the same benthic feeding guild, exposure route, and chemical sensitivity as sediment invertebrates.

The approach for addressing benthic risk should be updated by:

- Using the PRGs derived from the Logistic Regression Model with a Pmax of > 0.5 (indicating moderate and high toxicity) to define the benthic risk area. The state recommends using this

model because it is nationally peer reviewed, incorporates models and toxicity correlations for individual contaminants, and represents comprehensive model predictions to both test species (Hyalella and Chironomus) and endpoints (survival and biomass).

- Incorporating the benthic risk area from the Logistic Regression Model into the Alternative I active remediation area. This is estimated to add approximately 43 acres to the current Alternative I active remediation footprint and enhanced natural recovery area.
- Using a bioassay "test out" option during remedial design to confirm benthic risk and the need for active remediation in these additional areas.
- Allowing for an engineering evaluation of the effectiveness of enhanced natural recovery to address benthic risk areas outside of the current Alternative I footprint.

EPA Response

The evaluation of benthic risk in the BERA (Windward 2013) for the Portland Harbor Site considered multiple lines of evidence including sediment toxicity testing, the floating percentile and logistic regression predictive models, generic sediment quality guidelines, tissue residue assessment and comparison of surface water and transition zone water to water based toxicity reference values. As a result, reliance on a single model such as the Logistic Regression Model to assess risks to the benthic community is not consistent with the procedures used to assess benthic risk in the BERA.

The 4 to 8 percent number is based on the comprehensive benthic risk assessment. The feasibility study report (USEPA 2016b) used a different approach (comparison to RAO 5 PRGs). A total of 1,290 acres of benthic risk areas were identified using this approach, which is approximately 60 percent of the Site. Refer *Benthic Risk Theme Response* for additional details.

The sediment PRGs developed for RAO 5 (reduce risk to benthic organisms from ingestion of and direct contact with COCs in sediment to acceptable exposure levels) considered the tissue residue line of evidence, and the two site-specific predictive models of toxicity to benthic species. The lowest of these values for a given contaminant was selected as the RAO 5 PRG. COCs for which a site-specific value could not be developed (Lindane and zinc) relied on sediment quality guidelines (Probable Effect Concentrations taken from McDonald et al [2000]) and are used as the PRG. Water based exposures are addressed through RAOs 7 and 8. Thus, the PRGs presented in the final feasibility study report consider all lines of evidence (including toxicity through the use of the predictive models) considered in the evaluation of benthic invertebrate risk in the BERA rather than a single predictive model.

As presented in Figure 2.2-2 of the final feasibility study report, areas of benthic risk identified in the feasibility study report represent 1,290 acres of the Site. However, as further noted in the feasibility study report, interim targets for risks and hazard indices were established to evaluate the potential for achievement of PRGs in a reasonable time frame. For RAO 5, the interim target is based on multiplying the RAO 5 PRG by an order of magnitude to account for further reductions due to MNR. In addition, the post-construction interim target for RAO 5 was established at a 50 percent reduction in the area posing unacceptable benthic risk because risks to the benthic community are based on a population level rather than individual level effect and is considered a target to which the benthic population as a whole can be stressed and still recover. As shown in Table 22 of the ROD, EPA's selected remedy, Alternative F Modified, addresses 72 percent of the area with unacceptable benthic risks (the area that exceeds 10 times the benthic risk value).

During remedial design, additional data to be collected for selection and design of the remedial technology to be implemented in specific locations may include toxicity testing, as applicable to refine delineation of benthic risk areas, where benthic risk only is the driver for achieving cleanup levels in a particular area. Also, ENR will be assessed during site-specific design work for its ability to accelerate risk reduction (expected thru MNR albeit on a longer time scale) on a case by case basis.

4.1.5 Accommodate Current and Future Uses of the Harbor

Comment

Portland Harbor is an important reach of the Willamette River. This waterway simultaneously serves as a center for the region's economy, a cultural resource for tribes, a social and recreational resource for the City of Portland, and an important aquatic and riparian habitat for fish and wildlife – all of this in the midst of Oregon's most densely populated area.

The current and future uses of the Harbor must be preserved by:

- Ensuring that the remedy is compatible with, and does not irrevocably limit the current and future uses of, adjacent upland sites. This congruity is particularly important at adjacent upland site with a designated marine-dependent use under the City of Portland's recently-updated Comprehensive Land Use Plan.
- Retaining the two existing boat ramps within the Harbor at Swan Island Lagoon and Cathedral Park, and ensuring that at least one of these ramps is made available for public use at all times during construction. The remedy must not limit the current or future use of these popular fishing access areas, nor include restrictions that impact ramp maintenance or replacement.
- Minimizing the use of regulated navigation areas or water use restrictions in cap areas that limit restrictions on boat traffic, anchoring, or spudding where possible.

EPA Response

EPA appreciates the importance of the river for industrial, commercial, and recreational uses and the economic vitality of the region. Of the 2,167-acre Site, active cleanup would take place in approximately 394 acres, or only about 18 percent of the Site. Cleanup activities will likely take place within that small portion of the Site at different times throughout the construction period, as determined during remedial design. As such, portions of the river will be inaccessible for some portion of the construction period, but much of the river and harbor would remain open. It is EPA's intention to avoid or minimize to the extent feasible, closing even on a temporary basis public access areas such as public boat ramps.

EPA has conducted extensive community outreach during all phases of the project and is committed to maintaining a transparent, proactive community interaction process during each cleanup phase, with informal comment opportunities on all key elements of the design and implementation. EPA is committed to working with the community to minimize any short-term impacts, including any temporary disruptions to public amenities.

EPA recognizes that Regulated Navigation Areas (RNAs) have impacts on the community as well by restricting public uses. In addition, RNAs may impact some property owners' ability to use and maintain their facilities and to construct or develop new features on their property in certain areas, or add expense to do so properly (as approved by EPA). However, limitations on some uses of the river may be needed to implement a cost-effective and protective remedy that addresses releases of

hazardous substances. The feasibility study report (USEPA 2016b) evaluated the reliability and implementability of Waterway Use Restrictions or RNAs. Such designated restricted areas may be necessary to ensure the integrity of caps are maintained by limiting activities that could affect the ability of the cap to contain contaminated sediment or groundwater from being released to the environment. This could include prohibiting anchoring of vessels or the use of spuds to stabilize vessels in areas containing caps. Notifications such as signs and buoys may be used to warn vessels from the area.

RNAs have been successfully used in the past to protect remedial actions at the Site. RNAs were required to protect the McCormick and Baxter cap and the Gasco interim action cap from vessel activities. Periodic inspections of RNA notifications will be needed to ensure they are functional and effective. During remedial design, decisions as to where dredging and capping will occur will be made and necessary ICs to protect the cleanup will also be determined and implemented. Where possible, caps should be designed to minimize the need for RNAs but will have to be fully effective in containing contaminated sediment or groundwater and consistent with anticipated land uses

The enforcement of RNA-related ICs with respect to the governmental entity that will provide enforcement authority will be determined during the development of remedial design and identification of responsibilities in an ICs implementation and assurance plan and operation and maintenance plan to be developed jointly between federal agencies (such as EPA, USCG, etc.) the appropriate agencies from the State of Oregon.

The ICs implementation and assurance plan approach for the RNAs IC may include, but not be limited to, the following:

- Form an inter-agency team made up of representatives from EPA, DEQ, tribes, Oregon Department of State Lands, Coast Guard, Oregon Marine Board, Oregon Department of Transportation, U.S. Army Corps of Engineers, City of Portland, Port of Portland, and others to identify key concerns about the development and implementation of RNAs at the Site, including ongoing and future maintenance dredging, and emergency access plans
- Work with land-owners along the Site to identify and map nearshore and river bank structures, facilities, and associated activities that may affect the siting and/or effectiveness of RNAs
- Map the river uses on a facility and site-wide scale for the purpose of delineating RNAs and evaluating their overall impact with reasonably anticipated land uses
- Where necessary to protect caps or other remedial features, establish RNAs limiting waterway and land use activities such as boat anchoring and keel dragging, structure and utility maintenance and repair, and future maintenance dredging
- Conduct outreach and education to recreational boating communities and other river users regarding RNAs to ensure they are effective and appropriate, RNA notice signs are designed, installed, and maintained effectively and at the appropriate locations, in coordination with the inter-agency team
- Monitor the effectiveness of RNAs and other ICs such as fish consumption advisories as part of long-term monitoring for the Five-Year Review process

During remedial design, EPA and the PRPs will consider site-specific factors, including river use restrictions related to RNAs, and will coordinate with USACE and other agencies through the IC planning process for selection of the preferred remedial technology that best meets required objectives, including protection of human health and the environment while factoring in implementability concerns.

4.1.6 Consider Potential Impacts of Transportation Modes

Comment

Alternative I includes removal of nearly 2 million cubic yards of soil and sediment from the river. This material will need to be transported and disposed of in a manner such that it no longer poses a risk to human health and the environment. The proposed plan retains truck, rail and barge shipment of dredge materials as potential modes of transportation. The state is concerned that transporting materials and equipment to or from the site (or transloading facility) by truck would increase road congestion and air emissions, which have real economic, community livability, and environmental consequences. A remedy that relies on trucks would also have a greater impact on roadway infrastructure, requiring greater maintenance and repair.

The impacts from transporting dredge material must be considered by:

- Identifying a preference in the ROD for transporting dredge spoils by rail and barge.
- Acknowledging that the transportation needs and impacts associated with each transportation mode will be evaluated and considered during remedial design to ensure that transportation modes are thoughtfully selected, balanced, and minimize impacts to surrounding communities, transportation safety, and infrastructure.

EPA Response

The ROD has a preference for lower impact transportation methods for the transport of dredged sediment that will minimize the impact to surrounding communities (such as rail or barge). Dredged material would be loaded directly into barges and transported for dewatering, treatment, or further transport for disposal. River bank materials excavated from above the water line were assumed to be loaded directly into containers to be transported by rail or barges for transport.

EPA concurs with DEQ that transportation modes will need to be carefully considered during design and implementation of the selected remedy. Because all of the various external factors that could affect mode of transport (such as location of transload facilities, selection of disposal facilities, volumes of wastes and materials generated for transport over the length of construction, etc.) cannot be fully known at this time, the modes of transport in the feasibility study report (USEPA 2016b) to be used will not be prescribed. However, EPA did assume barging as the representative mode of transport because it reduces environmental impacts and enhances community and worker safety over other modes of transport. During remedial design, EPA will work with the entities implementing the remedy to carefully evaluate and select the most appropriate modes of transport to account for factors such as reducing environmental impacts and short-term impacts. A green remediation plan will be prepared for each action which will discuss how impacts will be mitigated to the extent possible and as part of this analysis rail and barge transport of wastes will be discussed, and used wherever possible to limit greenhouse gas emissions and lessen neighborhood impacts for air toxics such as sulfur oxides, consistent with EPA national and regional guidance. Where trucking cannot be avoided, the plan will discuss optimum haul routes to minimize diesel exhaust exposure to sensitive subpopulations (known to cause childhood asthma), such as residential streets near schools.

4.1.7 Allow Design Flexibility to Account for Uncertainty

Comment

Portland Harbor is considered a "Mega Site" due to its extraordinary size and level of complexity. Although extensive site-wide data have been collected over the years, there are still a number of uncertainties in the physical, chemical, and regulatory elements of the Site. For a sediment site of this magnitude, this is not unusual; however, EPA must support a design process that incorporates flexibility as a means for addressing these complexities and uncertainties while assuring compliance with the ROD.

No one-size-fits all approach can accurately predict and account for the unique characteristics of individual areas in the river. Professional judgment and experience must play a strong role to ensure that the remedy constructed is protective of the human health and the environment at individual SMAs in the river.

Flexibility in remedial design can be achieved by:

- Acknowledging that a standardized decision-making approach was applied for ease in developing site-wide remedial alternatives, but modifications to this approach will be needed to refine the selection and extent of remedial technologies on an SMA-specific scale. This may include consolidating or smoothing the pixilated areas of dredging and capping to improve constructability.
- Acknowledging that the conceptual site model will likely need to be updated during remedial design for specific SMAs. For example, surface water and tissue data at the Willamette Cove site suggests that there may be an active in-river source(s) not yet identified which may require an alternative remedial technology.
- Describing how subsurface contamination will be considered during remedial design, if at all, in defining the boundaries of active remediation areas. It is the state's understanding that SMAs identified in the proposed plan are mapped by comparing RALs to surface sediment chemistry and not subsurface chemistry.
- Giving equal preference to dredging and capping in the intermediate river region where there is no NAPL. The ROD should not require capping of these areas if Performing Parties determine during remedial design that dredging is more cost effective or otherwise preferable in order to avoid requirements for long-term cap monitoring and maintenance and reduce compensation to the Department of State Lands. Similarly, the ROD should not require dredging if a more detailed assessment during remedial design discovers substantial amounts of buried debris, geotechnical hazards or other conditions that would increase the risk of contaminant resuspension and downstream transport, risk to construction workers or otherwise render dredging to be infeasible.
- Describing criteria for selecting thin-layer sand capping, called ENR, at Swan Island Lagoon. Allow for refinement of the ENR footprint, if appropriate, after a more in-depth assessment of sediment deposition rates. For example, it's unclear why monitored natural recovery would not be effective in the downriver portion or the lagoon.
- Allowing flexibility to accommodate future in-river infrastructure projects. For example, a cap in the vicinity of a bridge will impact ODOT's ability to perform maintenance and construction

work around bridge support structures in the river if a cap is not carefully located. For seismic upgrades on the St. John's Bridge and the Fremont Bridge, the bridge piers will increase in size by as much as 50 percent and the in-river work would require a setback of approximately 20 feet around the piers. If a cap is placed in the vicinity of a bridge pier before seismic upgrades occur, the cap could be damaged from construction equipment anchoring or disturbing the river floor.

EPA Response

EPA acknowledges that new data will be collected during remedial design. These data will be used to support future decisions regarding remedial action footprints, technology assignments, use restrictions or other ICs, treatment and disposal of dredged material, mitigation requirements, among others. This new data will be used to update the CSM. If new information indicates that a different technology, beyond dredging and capping is necessary, what additional analysis to determine the alternative will be determined at that time.

Subsurface contamination data will be collected, refined and evaluated in defining the boundaries of active remediation areas during remedial design phase of the project. The ROD includes a flexible decision tree along with general design requirements to guide the assignment of capping and dredging technologies, based on specific characteristics within SMAs. The decision tree will be used during remedial design to define what actions should be taken under different environmental conditions and locations based on the most recent design data. Once the data and river factors are evaluated within the context of the decision tree, a final design for construction can be completed. This design will then dictate the remedial construction. The decision tree is intended to provide clear direction on what actions should be taken under the different conditions and locations.

The feasibility study report (USEPA 2016b) identified areas for dredging or excavation or capping based on site-specific factors that may limit the effectiveness of containment, in-situ treatment, enhanced natural recovery ENR or MNR. Within the navigation channel or future maintenance dredge areas, removal was required to prevent restrictions on navigation. In the intermediate areas, a multi-criteria decision matrix was developed as a method to guide the assignment of capping and dredging technologies, based on site-specific characteristics within sediment management areas. In shallow areas, a mix of shallow removal followed by capping or placement of backfill was utilized to maintain current water depth and thus limit the loss of shallow water aquatic habitat.

The selected remedy was chosen in order to provide a balance between minimizing the time required for remediation and implementing a suitably protective cleanup to minimize the risk to public health and the environment in the future, in an area where ENR is very likely to be highly effective. EPA's analysis of alternatives shows that a larger, removal-based remedy in the Swan Island area would not considerably improve public health and environmental protection, would take a longer, cost substantially more, and have greater short-term impacts to the benthic community and aquatic organisms and to the community surrounding the area because of dredging activity (see Section 2.31.2 of the responsiveness summary and 10.1.17 of the ROD. After the remedy has been implemented, EPA will use sampling and monitoring results to guide and refine the cleanup action selected to provide additional assurance that the process is reducing contaminant concentrations and bioavailability as expected.

As mentioned above, the selected remedy was chosen to provide a balanced approach in achieving remedial cleanup levels. The ROD includes a flexible decision tree which will dictate the design and

remedial construction and is intended to provide a clear direction on what action should be taken under different conditions and locations.

EPA's remedy decision primarily selects final cleanup levels for the COCs at the Site and establishes remedial action levels for focused COCs that triggers more active cleanup technologies than MNR. EPA agrees that maintaining flexibility in construction methods through the remedial design phase is an important consideration. Additionally, EPA agrees active cleanup technology assignments will be evaluated during remedial design based on new data and area-specific conditions and land uses and other requirements specified in the ROD. As pointed out by the state, status of source control efforts will be evaluated during design, to ensure that upland and in water sources are accounted for by the remedial approach.

As mentioned above, the decision tree will be used during remedial design to define what actions should be taken in different areas of the Site based on the most recent design data. Once the data and river factors are evaluated within the context of the decision tree, a final design for construction can be completed. Based on empirical data, if MNR is shown to be sufficiently effective, it may be selected over ENR in certain portions of Swan Island Lagoon. Dredging in areas where capping is prescribed will be allowed on a site-specific basis, e.g. where dredging is more conducive to future site uses. Likewise, future plans for infrastructure such as oil pipelines, electricity transmission cables, and upgrades to bridge structures will be accounted for during both the design and approach taken in the sequencing of a cleanup, e.g. accelerating a transmission line replacement that is planned before placing a protective cap in an area.

4.1.8 Realize Cleanup Costs are Uncertain and Likely Underestimated

Comment

The state is concerned that EPA's cost estimate for Alternative I may underestimate the actual total project cost, and that the proposed plan does not adequately describe key uncertainties with the estimate. The state recognizes the difficulties in developing an accurate cost estimate for a site as complex as Portland Harbor, but requests that the ROD provide additional clarification about cost assumptions, uncertainties and sensitivities.

Project uncertainties in the estimated cleanup costs should be accounted for by:

- Acknowledging that the actual cost of Alternative I will likely fall outside the desired range of -30 percent to +50 percent the estimated cost that is specified in EPA guidance documents.
- Identifying cost assumptions with the greatest amount of uncertainty, which have potential to most significantly influence the total project cost. The state anticipates that handling, transporting, treating, and disposing Subtitle C and Subtitle D dredge material will have the greatest potential to significantly increase the cost of the remedy due to uncertainties in the disposal volumes and treatment requirements for this material. Further complicating this effort is the uncertainty of a local disposal option for Subtitle D dredge material, particularly in light of the widespread opposition to the proposed confined disposal facility (CDF) at Terminal 4. If an acceptable facility were developed that could handle most or all of the Subtitle D wastes without the need for transloading to rail or truck, significant cost savings would be realized, not to mention increased implementability, reduced implementation risk and reduced carbon footprint/ greenhouse gas emissions. An example of a potential facility not contemplated in the feasibility study is the former Boise White Paper wastewater lagoon recently proposed by the

City of St Helens as a regional, state-permitted, disposal site for dredge spoils and other non-hazardous wastes. Other key costs with significant uncertainty are open water dredging, project management, remedial design, mobilization/ demobilization and contingency (scope and bid).

- Including a table comparing the non-discounted costs against a range of discount rates as done for the Lower Duwamish Waterway Superfund Site. Discount rates are used as a tool to predict the money needed today to fund the project into the future, largely based on predicted interest rates for the project duration. The state suggests comparing non-discounted costs to a 7 percent discount rate, per EPA's guidance, and the 2016 30-year real discount rate of 1.5 percent, to better reflect current economic conditions.

EPA Response

EPA does not agree that the intended costs will likely fall out of the range of expected cost accuracy as intended in EPA guidance. EPA's cost estimates were produced consistent with EPA guidance by using a proper cost methodology as described in guidance, using appropriate cost sources, and reasonable assumptions and related quantities. The expected accuracy stated in this guidance for feasibility study cost estimates is +50 percent to -30 percent of actual cost, which means that a remedial alternative's cost at the time of construction could be as much as 50 percent higher or 30 percent lower than as presented in the proposed plan (USEPA 2016c). These estimates are not intended to be highly detailed because the scope of the alternatives in a feasibility study is much lower than later during design and construction of a remedy when more data are available and there is a better understanding of the construction timelines and funding. This is particularly true of projects such as the Portland Harbor cleanup where the scope of the cleanup is large (over many river miles), so the sequencing of construction work will likely be complex. The cost estimates are developed to reflect the understanding of the alternatives as described in the feasibility study report (USEPA 2016b) given the understandable uncertainties that exist and will continue to exist even after a decision on a remedy approach is made, prior to design and construction. Cost estimates prepared later in the Superfund process, when more information is available, will be developed to address project budgeting with a corresponding higher accuracy.

EPA has documented the methodology and assumptions used in developing feasibility study cost estimates in Attachment A of Appendix G of the 2016 feasibility study report. Cost estimates were developed according to "*A Guide to Developing and Documenting Cost Estimates during the Feasibility Study*" (USEPA 2000) and include the level of detail and backup suggested by the guidance to meet the accuracy requirements for feasibility study cost estimates (-30 percent to +50 percent of actual cost). While there is some uncertainty about the cost impacts from waste treatment and disposal assumptions, EPA's assumptions on these issues were based on actual work that has previously occurred at the Site during early actions.

As part of the effort to address concerns about cost uncertainties, EPA and DEQ collectively performed a "deep dive" into cost estimate drivers and related assumptions starting in early 2016. That analysis showed that waste transport, treatment, and disposal costs were significant drivers for all alternatives with respect to overall costs. As a result of that identification, EPA reevaluated transport, treatment, and disposal assumptions including using information from early action work within Portland Harbor and contact with the representative transport and disposal facilities. This information was used to refine costs as much as can be done at a conceptual phase of the project. EPA's position is that sufficient due diligence has been done with respect to addressing concerns about significant cost drivers for the feasibility study. It should also be noted many of these same drivers were addressed in

the sensitivity analysis presented in Appendix N of the feasibility study report. This is consistent with the recommendation in the third paragraph on Pages 4 and 5 of the guidance (USEPA 2000) and with DEQ's request to understand cost sensitivity.

EPA recognizes that the intended purpose and use of cost estimates during a feasibility study for remedial alternatives may be misunderstood by those not familiar with the Superfund process, leading to the incorrect perception that feasibility study cost estimates are "inaccurate" or not the "true" costs or may fall out of the intended range of accuracy. The stated purpose for feasibility study cost estimates is to compare remedial alternatives during the remedy selection process, not for establishing construction project budgets nor for negotiating Superfund settlements with potentially responsible parties to pay for cleanups.

EPA recognizes that potential significant cost savings that could be realized if a proposed disposal facility in close proximity to the Site and adjacent to the river to minimize transload requirements is available for disposal of dredged contaminated sediments and excavated river bank soils.

EPA will consider the potential use of the proposed facility for disposal of contaminated sediments and soils (excluding those sediments characterized as containing Resource Conservation and Recovery Act /state hazardous waste or Toxic Substances Control Act waste). EPA's consideration will be contingent upon the proposed facility's ability to conclude the Subtitle D permitting process, meet EPA's requirements under the "Off-Site Rule", and be available for disposal during the implementation of remedial action at the Site. Since it is expected that responsible parties will be implementing cleanups, if a facility otherwise complies with the Off-Site Rule and is appropriate for the waste to be disposed, EPA cannot mandate or require the use of a particular disposal facility if other approved facilities are available and selected by the responsible parties.

It should be noted that while EPA used a 7 percent real discount rate for presentation of the alternative costs, a sensitivity analysis was performed for varying discount rates and presented in Appendix N of the feasibility study report. This is consistent with the recommendation in the third paragraph on Pages 4 and 5 of the guidance (USEPA 2000) and with DEQ's request to look at additional discount factors. See also Section 2.22 of this responsiveness summary.

4.1.9 Focus Cleanup Levels on the Sediment Remedy

Comment

It is critically important that EPA provide clarity regarding when the CERCLA cleanup is complete. Portland Harbor was listed under CERCLA as a sediment site, and the remedial alternatives evaluated in the feasibility study are based on cleanup of contaminated sediment. In the proposed plan, EPA proposed PRGs for surface water, groundwater (porewater) and fish tissue. These non-sediment PRGs have potential to cause significant confusion and uncertainty. The state considers the primary goal of the remedy to reduce sediment contamination to risk-based or background levels. This will, in turn, result in reducing contaminants in fish/shellfish tissue, groundwater (porewater), and surface water. Further reductions in all media will be achieved through source control and watershed actions. Therefore, cleanup of contaminated sediments will contribute to meeting the remedial action objectives for other site media, but will not independently meet them.

The state is concerned about using PRGs for fish tissue, surface water, or groundwater as formal cleanup levels in ROD, particularly where there is not a thorough understanding of the technical practicability of achieving and measuring these criteria. For example, many of the surface water,

groundwater (porewater), and tissue PRGs (e.g. PCBs, DDx) are set below background levels. Also, the PRG for surface water and porewater PCBs, for example, is well below analytical detection limits. In addition, the contribution to porewater from contaminated sediments versus contaminated groundwater plumes is indistinguishable for some contaminants; this is not accounted for in the decision trees for the technology assignments.

The cleanup goals should be clarified by:

- Establishing formal cleanup levels based on sediment PRGs only.
- Retaining the surface water, groundwater, and fish/shellfish tissue criteria as measures of progress to evaluate the effectiveness of the sediment remedy in reducing risks associated with these media, but not as formal cleanup levels, similar to what was done on the Lower Duwamish Waterway.

EPA Response

Releases of hazardous substances have occurred to surface water and groundwater, in addition to sediment, that present unacceptable to risk to human health and the environment in the in-river portion of the Portland Harbor Site, therefore, it is appropriate to develop cleanup levels for these media. Likewise, fish and shellfish tissue PRGs were derived because tissue concentrations represent a direct exposure point for human and ecological receptors, and because target tissue concentrations are needed to derive sediment PRGs for protection of human health due to fish consumption.

Consistent with CERCLA and the NCP, cleanup levels are to be developed based on chemical-specific ARARs, including MCLs promulgated under the Safe Drinking Water Act and water quality criteria established under the sections 303 or 304 of the Clean Water Act if more stringent than state-promulgated standards and relevant and appropriate under the circumstances of the release. Thus, cleanup levels for surface water and groundwater are based on state water quality criteria, federal 304(a) criteria, and MCLGs/MCLs or regional screening levels when there was no SDWA standard. Upon considering public comments on fish tissue PRGs, EPA has decided to make fish tissue levels target goals instead of enforceable cleanup levels.

EPA disagrees that surface water and groundwater cleanup levels should not be established without a thorough understanding of the technical impracticability to achieve them. Rather, evidence is required first to show it is technical impracticable to attain ARARs before they can be waived. At this time, there is no such evidence to support ARAR waivers.

See Section 2.3 of this responsiveness summary for more detail regarding surface water, groundwater, and fish/shellfish tissue criteria as measures of progress to evaluate the effectiveness of the sediment remedy in reducing risks associated with these media.

4.1.10 Revise River-Bank Approach to Be Consistent with Joint Source Control Strategy

Comment

In 2005, DEQ and EPA developed a Joint Source Control Strategy, which identifies a framework for conducting source control work consistent with anticipated in-river remedy objectives. This framework includes a process for screening and evaluating river banks to determine whether remedial action may be required. The state understands that the intent of RAO 9 is to reduce migration of contaminants from river bank soil to sediment and surface water, such that levels are

acceptable for human health and the environment. This objective can be adequately addressed under an updated Joint Source Control Strategy framework.

The approach to river bank cleanup should be revised by:

- Referring to the joint source control strategy for using site-specific lines and weights of evidence to determine whether a river bank source control measure is warranted. The joint source control strategy should be updated to use in-river sediment preliminary remediation goals as screening criteria for river bank source control evaluation. However, the PRGs for remedial action objective 9 should not become formal cleanup levels. This change also addresses the DEQ's concern that the RAO 9 PRGs for arsenic, cadmium and mercury are lower than upland background values determined by DEQ5. Neither EPA nor DEQ have conducted a background evaluation to determine upland background concentrations for the organic compounds. It is likely that the PRGs for some of the organic compounds are also below background.

- Making a distinction between river banks referred to EPA that have been identified by DEQ as contaminated and requiring a bank source control measure, versus those that are contaminated with a need for bank action to be evaluated during remedial design.

EPA Response
EPA is committed to ensuring that upland and upriver contaminant sources to the Willamette River are controlled because source control is critical in achieving the remedial action objectives for the Portland Harbor cleanup. Please also see LSS Dispute Issue 14 and 18 and LWG Dispute Issue 1q responses.

The Joint Source Control Strategy is a living document, and EPA is confident that EPA and DEQ will continue to update the strategy as appropriate post ROD to account for new information, such as incorporating the final cleanup levels in the ROD. EPA will be seeking new data post ROD, and will incorporate new information regarding background values such as those for arsenic, cadmium and mercury. River banks referred to EPA versus not will continue to be evaluated as new data are gathered. River banks that require cleanup where contamination is contiguous between and upland area and area in water to be dredged or capped will be cleaned up together in most cases, to minimize overall impact on the environment, expedite cleanup, and minimize recontamination potential.

4.1.11 Consider the Different Types of Groundwater Plumes in Cleanup

Comment
The proposed plan calls for in-situ treatment for residual groundwater plumes potentially discharging contaminants to the river. The state is concerned that the prescriptive technologies identified for groundwater plumes do not adequately consider the various types of plumes present within Portland Harbor.

The cleanup actions for groundwater plumes should be refined by:

- Updating the decision trees for the shallow and intermediate regions to identify two categories of groundwater plumes.
    - Groundwater plumes that are expected to naturally attenuate. If a plume will attenuate in a reasonable amount of time, no additional treatment or engineering

controls would be required such as the addition of activated carbon to the residuals layer or construction of a reactive engineered cap.

  - Groundwater plumes that are not expected to naturally attenuate. For plumes that are not expected to attenuate in a reasonable amount of time (e.g., portions of the Gasco, Rhone-Poulenc and Arkema plumes) reactive engineered caps should be the assigned remedial technology within the groundwater plume discharge area.

- Considering the compatibility of the selected remedy with upland source control efforts in areas with groundwater plume discharge, and with the aim of integrating in-river and upland remedies.

EPA Response
Early source control actions conducted under DEQ authority are not final CERCLA actions. EPA will be evaluating the effectiveness of any source control actions conducted under DEQ authority with final cleanup objections and making the determination as to whether further action is warranted. Where early source control actions meet the requirements of the ROD, then EPA will not require further action to be taken in those areas. There may be upland groundwater plumes that are beyond the upland control point that may need further control in the river (sediment cap or amendment to a sediment cap) which will be accounted for during site-specific designs.

The remedial design for in-river actions will evaluate site-specific information in detail. The remedial design will include an evaluation of the completeness of the site-specific groundwater pathway and effectiveness of SCMs which have been implemented at each facility. The ROD includes a simplified and flexible decision tree which will dictate the design and remedial construction and is intended to provide a clear direction on what action should be taken under different environmental conditions and locations, which may include design needs that apply upland and in water to ensure a comprehensive site remedy that will meet cleanup levels.

4.1.12 Clarify Oregon Marine Board's Authority and Role in Implementation

Comment
The proposed plan states: "Where caps will be utilized to contain contamination in navigable areas of the river, waterway use restrictions or RNAs [regulated navigation areas] will be necessary to ensure the integrity of the cap is maintained in perpetuity. These restrictions would preclude boat anchoring and keel dragging, the use of spuds to stabilize vessels, structure and utility maintenance and repair, and future maintenance dredging in areas containing caps. Notifications such as signs and buoys placed by the Oregon Marine Board may be used to warn vessels away from the area." This language is incorrect - the Marine Board does not have the authorities described in the proposed plan.

The role of the Oregon Marine Board should be clarified by:

- Explaining that the Marine Board will not purchase or place signs and buoys, as this is the responsibility of the applicant for a waterway marker permit. The Marine Board Waterway Marker Permit is required in addition to the Private Aid To Navigation (PATON) permit required by the US Coast Guard. The Marine Board will approve the placement of waterway markers through the waterway marker permit application process, provided that the regulation listed on the waterway marker is adopted in code, statute or rule to be enforceable.

- Specifying which enforcement agency (US Coast Guard or State of Oregon) will be responsible for enforcing any new regulated navigation areas. Any lead agency will need to propose and adopt regulations accordingly, either in federal code, state law or both.
- Allocating adequate funding to pay for enforcement of regulated navigation areas "in perpetuity."
- Acknowledging that slow-no-wake safety zones required for in-river work or near-water work must be adopted in state rule or statute to be enforced by the state. The Marine Board requires prior notice and planning as to how the zones will be marked for enforcement to occur. Any contractor doing in-river or shoreline work will need to pay for waterway markers and dedicated work-zone enforcement from marine patrol as the buoys and hours will not be paid for by Multnomah County or the Oregon Marine Board.

EPA Response
EPA acknowledges the misstatement regarding the role of the Oregon Marine Board in placement of waterway markers. The ROD does not say the Board has enforcement authority. The enforcement of RNA-related ICs with respect to the governmental entity that will provide enforcement authority will be determined during the development of remedial design and identification of responsibilities in an ICs implementation and assurance plan and operation and maintenance plan to be developed in coordination with federal agencies (such as EPA, USCG, etc.) and the appropriate agencies from the State of Oregon. Funding for IC planning activities will be worked out during negotiations with performing parties.

4.1.13 Recognize Department of State Lands' Authority and Role in Implementation

Comment
Oregon Department of State Lands manages state-owned submerged and submersible land, which the state holds in trust for the public6. The use of state-owned land in conjunction with remedial activity is governed primarily by Oregon Administrative Rules Chapter 141 Division 145 (effective February 2014). These rules describe the process by which Oregon Department of State Lands will determine the compensation due the state for the required use authorizations. This determination requires calculation of the "Site Diminishment Impact" (or SDI) of the proposed remedial action based on its anticipated impacts on public trust uses, the duration of those impacts, and the extent to which the remedial action will impair the Department's ability to manage the affected land in the future. Greater impacts or restrictions on public trust uses of state-owned submerged and submersible land will compel greater compensation.

Performing parties will need to coordinate with Department of State Lands. This process should begin prior to remedial design so that input can be considered and incorporated into that design. Early review of remedial design will facilitate a more accurate estimate of the required compensation and may help identify potential options for reducing that compensation. For example, cap design (e.g. location, thickness, material, etc.) that minimizes the impact to public trust uses (e.g. does not prevent or impair anchoring, fishing, or motor usage) will require less compensation to the state than a cap that restricts public trust uses or impedes Department's ability to lease the property in the future (e.g. restrictions on driving pile, placing docks, etc.). Similarly, a number of small caps in close proximity may impose greater impacts on public trust uses than each cap would have when viewed in isolation. Cumulative impact will be considered in calculating the SDI of each cap, and may impact the

compensation due. (A large number of small caps will also increase the tracking, monitoring and enforcement workload for Oregon Department of State Lands and other agencies and, for that reason, is not favored.)

The proposed plan does not include the cost of Department of State Lands use authorizations, which could range as high as $15 million harbor-wide (reflecting a site-wide average of roughly $230,000/acre) for sediment cap easements alone, and have the potential to affect the evaluation of relative costs in selecting between capping and dredging technologies.

The role of Department of State Lands should be clarified by:

- Expressly recognizing the state's land management role in remedy implementation, specifically their role in authorizing the use of state-owned submerged and submersible land for remedial activities.
- Identifying the potential costs associated with use authorizations, recognizing that these costs can be most effectively managed by their consideration in the early stages of remedial design, and in consultation with the Department of State Lands.
- Providing flexibility during remedial design such that performing parties can, consistent with remedial action objectives, reduce or eliminate impacts to and restrictions on public trust uses of state-owned submerged and submersible land, including by switching from capping to dredging.

EPA Response

Department of State Lands propriety authorizations, which include lease fees, were not included in the cost estimates. EPA acknowledges that the State Land Board through the Department of State Lands-promulgated rules for granting and renewal of access authorizations, leases, and easements issued to facilitate remediation conducted pursuant to an order issued by DEQ or EPA and habitat restoration activities in, on, under or over state-owned submerged and submersible land. However, Section 104 of CERCLA, 42 U.S.C. § 9604 provides the President with broad authority to take response actions determined necessary to protect the public welfare and the environment from releases or the potential threat of a release of hazardous substances or pollutants and contaminants to the environment presenting an imminent and substantial endangerment to public health and welfare.

Section 104(e)(3) specifically provides the President authority to access "[a]ny vessel, facility, establishment, or other place or property where entry is needed to determine the need for response or the appropriate response or to effectuate a response action under" CERCLA. 42 U.S.C. § 9604(e)(3). Furthermore, Section 121(e)(1) of CERCLA provides that: "[n]o federal, state, or local permit shall be required for the portion of any removal or remedial action conducted entirely onsite, where such remedial action is selected and carried out in compliance with" CERCLA. 42 U.S.C. § 9621(e)(1). If EPA were to perform the remedy, the United States would not be required to pay state fees. However, EPA expects most, if not all, of the remedy (cleanup actions) will be performed by PRPs and EPA anticipates that PRPs will negotiate reasonable terms and conditions of access to private and state-owned property to implement the remedy likely with landowners and Department of State Lands. The selected remedy overall is expected to improve the sediment and surface water quality of the river. EPA's selected remedy seeks to minimize land and river use restrictions, while also assuring long-term protectiveness and a cost-effective cleanup. EPA encourages performing PRPs to coordinate with

Department of State Lands early during remedial design to negotiate access and find further ways to reduce land and river use restrictions and, if relevant, diminution of property values.

During design, additional data will be collected that will identify where dredging and capping should occur within the Site and this sampling will occur with much more detail than previous sampling. Contaminant concentration data will be used to identify where capping or dredging should occur. Identifying whether capping or dredging is most appropriate for an area will be determined based on location-specific land uses and river conditions and whether or not the material can be effectively contained with a cap. If it is possible to cap the contamination, a cap likely will be used. If a cap is not appropriate based on land/river uses or water level depth, wind or wave action, dredging will likely be the technology applied. Depth of dredge will be based on depth of contamination and whether a cap could be incorporated into the design. In the feasibility study, it was determined that capping was not appropriate for areas that would be dredged for navigation and ship berthing and there were assumptions about where this kind of activity occurred. During design, these areas will be more accurately identified and where maintenance dredging is not a reasonably anticipated future use, the remedy will be adjusted and capping could be used instead of dredging.

4.1.14 Clarify Oregon Health Authority's Role in Developing and Implementing Fish Advisories

Comment

All existing fish advisories in Oregon were developed and issued by the Oregon Health Authority using EPA guidance. They typically communicate these advisories via news releases and its website. In some cases, local health authorities or local water body managers post signs on behalf of Oregon Health Authority. Generally speaking, county health departments are the most appropriate entity to conduct outreach and community engagement for local public health issues; however, they often lack the staff capacity and funding to do so for environmental health issues. Portland Harbor is located within the Multnomah County's jurisdiction. With the appropriate level of resources, Multnomah County Health Department would be the entity to implement a fish advisory outreach program for Portland Harbor.

The role of Oregon Health Authority should be clarified by:

- Specifying the role of state and local health authorities in developing and implementing fish advisories.
- Identifying the resources and funding that EPA will provide to state and local health authorities for conducting effective community outreach and education.

EPA Response

EPA explained the need for fish consumption advisories in both the feasibility study and the proposed plan (USEPA 2016c) based on the results of the BHHRA (Kennedy/Jenks 2013) in the remedial investigation report (USEPA 2016a). EPA has clearly identified in the ROD the need for fish consumption advisories during and after construction of the remedy until cleanup levels are achieved. Even then, watershed-wide fish consumption advisories such as the existing Oregon Health Authority advisory may need to remain in place because there are sources of contamination that are outside of the scope of the Superfund cleanup (such as upstream sources of naturally-occurring mercury).

EPA recognizes that fish consumption advisories are more effective with community support. During remedial design, EPA will develop an ICs implementation and assurance plan that lays out the approach for the development and implementation of all ICs required by the ROD to protect humans

from exposure to site contaminants and to protect the remedy put into place. Specifically, the use of fish consumption advisories and RNAs, and the entities responsible for implementing them. Additional IC mechanisms may be developed during remedial design, as needed.

The primary goal of the ICs implementation and assurance plan is to establish and document the activities necessary to implement and ensure the long-term stewardship of ICs, and specify the persons and/or organizations that will be responsible for conducting these activities. In development of the ICs implementation and assurance Plan, EPA will coordinate with river users, property owners, communities and other stakeholder groups to minimize the long-term impacts of ICs as part of the remedial action.

The approach for the fish consumption advisory IC will likely include, but not be limited to, the following:

- Survey fisher communities, including Tribal, low-income, minority, and immigrant communities, to verify the fish species being consumed, consumption rates, preparation and cooking practices
- Develop a fish tissue sampling plan including species, numbers, and size of fish to be sampled, as well as tissue surrogates, such as passive sampling devices, where needed
- Use fish tissue and other empirical data to support the five-year review process in evaluating the relative success of remedial measures against RAOs
- Collect fish tissue data during remedial design (baseline) and throughout construction as part of the comprehensive monitoring plan for the Site
- Establish fish consumption advisories that are fully protective of human health throughout construction and following construction based on on-going monitoring of fish tissue samples from upstream, within, and downstream of the Site
- Conduct outreach and education tailored to the affected communities to ensure that fish consumption advisories are effective and appropriate, advisory signs are designed, installed, and maintained effectively and at the appropriate locations, in coordination with Oregon Health Authority and Multnomah County Department of Health. Programs such as the education collaborative at Palos Verdes will be considered in development of the ICs implementation and assurance plan.
- Identify and educate fisher communities about mechanisms to reduce the impacts of fish consumption. The Agency for Toxic Substances and Disease Registry and/or Oregon Health Authority will review fish consumption information from EPA in their health assessment process, and offer health screenings if appropriate.
- Include coordination with sport or recreational fishing clubs and licensing locations
- Monitor the effectiveness of fish consumption advisories through surveys of fisher communities during construction
- Based on long-term monitoring as determined in the five-year review process required under CERCLA, re-evaluate fish consumption advisories to ensure they are fully protective but not overly restrictive and on target to meet long-term goals of the remedial action. This may include

special consideration of high use areas such as beaches and fishing areas at Cathedral Park, Willamette Cove, and Swan Island Lagoon.

4.2 Specific Text Concerns

4.2.1 River Bank Region, Page 12

Comment

The ROD should clearly define the term river bank and clarify whether the term applies to either a geomorphic feature or specified elevation.

EPA Response

The ROD defines river banks as top of bank down to the river.

4.2.2 Assumptions for Fish Consumption Rates and Patterns, Page 17

Comment

The ROD should make a distinction between anadromous species and resident species. Spring Chinook, steelhead, coho, shad, and lamprey are anadromous species likely have lower contaminant levels and are targeted by a wider and more diverse group of anglers. Resident fish like crappie, smallmouth bass, carp, bullhead, catfish have higher levels of contamination because their range is within Portland Harbor and these type of fish are more targeted by and more likely to be eaten by local residents.

EPA Response

EPA agrees that risk communication must be clear as to the types of fish that are unsafe to eat. The ROD and subsequent ICs implementation and assurance plan documents and advisories will distinguish between anadromous species and resident species with regard to fish consumption advisories.

4.2.3 Baseline Ecological Risk Assessment, Page 20

Comment

The ROD should specify that TPH is both TPH-Diesel as measured by the TPH-Diesel method and as the aliphatic EC10-EC12 fraction.

EPA Response

Due to the detections of TPH Diesel in groundwater and pore water at the Site and because the target reference value for C10 – C12 aliphatic hydrocarbons represents both the upper end of gasoline range hydrocarbons and the lower end of diesel range hydrocarbons, the target reference value for C10 – C12 aliphatic hydrocarbons was selected as the PRG in the feasibility study and now the cleanup level in the ROD.

4.2.4 Reactive Caps, Page 27

Comment

The ROD should describe the purpose and function of organoclay versus activated carbon, particularly with respect to effectiveness with NAPL.

EPA Response
Organoclay has a lower permeability than carbon and used to retard seepage velocity where groundwater plumes are suspected to be present. As discussed in Appendix D4 this low permeable material is used for significantly augmented reactive caps.

4.2.5 Productivity, Page 29

Comment
The Plan assumes a dredging season based on one in-river work period (July 1 through October 31). The ROD should acknowledge that there is a second in-river work period in the winter (December 1 to January 31st) and identify what, if any work, may be done during this period.

EPA Response
EPA will continue coordination with NMFS with regard to what in-river work activities, if any, would be allowed during the second in-river work period as well as any flexibility that might occur seasonally in the summer work window.

4.2.6 Potential Contaminant Release during Construction, Page 29

Comment
The ROD should include a statement that acknowledges the limitations of silt curtains and sheet pile walls.

EPA Response
Water quality controls, including silt curtains and/or sheet pile wall enclosures will be required to minimize releases to the water column associated with the presence of contaminated sediments, NAPL, debris and other chemical or physical conditions. The ROD addresses limitations of these water quality control systems. Various water quality controls will be evaluated on location specific basis during remedial design, given the variability of subaqueous conditions within the harbor. Details regarding sediment dispersion control and location-specific engineered rigid control measures will be determined during remedial design. Refer *Final GASCO Oversight Report, November 2006,* for various limitations in effective implementation of silt curtain system.

4.2.7 Dredge Residuals, Page 29

Comment
The plan states that "A 12-inch sand layer is assumed to be placed daily in all dredge areas to control residuals and releases." Daily placement of a residuals management layer is not practical and would have significant impact on the project schedule and costs with limited benefits. DEQ recommends placement of a single 12-inch dredge residuals management layer following dredging.

EPA Response
EPA agrees that residual management layers should be placed as soon as is practicable following dredging but likely not as often as on a daily basis.

4.2.8 Buried Debris and Piling, Page 29

Comment
The ROD should clarify whether debris removal will be required in capping areas and how debris may influence the technology assignment for dredging versus capping. In particular, there tends to be heavy debris in the intermediate and shallow water areas and along the river banks, which will hamper the efficacy of pre-dredging in these areas.

EPA Response
During remedial design, debris and other area-specific features will be evaluated. The decision tree in the ROD has been revised to clearly outline this process. Also, EPA agrees that maintaining flexibility in construction methods through the remedial design phase is an important consideration, particularly for nearshore areas near structures and area with debris.

4.2.9 Fish Advisories and Educational Outreach, Page 32

Comment
EPA should avoid issuing consumption advice with a time denominator greater than 1 month. For example, if the calculated meal recommendation is 6 meals in 10 years, the advisory should say no resident fish consumption. The main reason for this is clarity and usefulness of the information for the general public. Typical fishers are unlikely to keep track of their consumption of fish from a specific water body over a 10 year, or even 6 months, period. As a matter of practical risk communication, any recommendation that is more restrictive than 1 meal per month should be communicated as no fish consumption. The current fish advisory for Portland Harbor is zero meals per month for sensitive groups, especially pregnant and nursing women, and one meal per month for everyone else. Oregon Health Authority recognizes that the current recommendation is inconsistent with fish tissue data that have been collected and current fish advisory calculation methodologies. The current fish consumption advisory for Portland Harbor will be updated to recommend no consumption of resident fish. This adjustment will bring Oregon Health Authority's advisory into alignment with EPA's recommendation.

EPA Response
EPA agrees fish advisory information should be as clear as possible and an ICs implementation and assurance plan will lay out the approach for the development and implementation of ICs, including fish consumption advisories and timeframes with this in mind.

4.2.10 River Banks, Page 36

Comment
The Plan states that "The technology assignments for SMAs adjacent to identified contaminated river banks are extended to include those river banks." This is in conflict with the next sentence which states that "Where SMAs are projected onto the river bank, removal followed by capping is the assigned remedial technology." The ROD should clarify the technology assignment for river banks and should explain how river banks action will be integrated with ongoing source control efforts.

EPA Response
The updated technology assignment decision tree for decision making is included in the ROD. The ROD includes the flexibility for the remedial design to evaluate and select the appropriate remedial technologies. The remedial design will need to address site-specific factors such as highly toxic PTW, depth of excavation, on-site structures, site operations, habitat, and other site-specific features.

4.2.11 Long-Term Effectiveness and Permanence, Pages 52 through 55

Comment
The definitions of residual risk and post-construction risk are unclear. The ROD should clarify these terms and how the risks associated with each are calculated.

EPA Response
Residual risk is defined as the cancer risk or hazard index once the PRGs are achieved. Because not all selected PRGs are risk-based, the residual risk or HQ for individual COCs may be greater than the 1 x 10^{-6} cancer risk or HQ of 1 used to calculate risk-based PRGs. Also, the magnitude of residual risk for Portland Harbor is defined as the estimated residual risk based on the cleanup levels and is RAO specific.

Post-construction risks were calculated for RAOs 1, 2, 4, 5, 6 and 8 for each for each alternative carried through the detailed analysis. These evaluations required estimates of surface sediment concentrations averaged on the following spatial scales: rolling river mile concentrations averaged over 0.5 river miles for only the eastern and western nearshore river segments and Swan Island Lagoon, rolling river mile average concentrations for each river segment, SDU-scale SWACs, and a site-wide weighted average concentration for each COC. All post-construction risks are evaluated as only the contribution from the sediment.

Refer to Appendix J of 2016 feasibility study report (USEPA 2016b) for more details regarding how "Residual Risk and Post-Construction Risk" were estimated or calculated. Refer to Section 11 of the ROD for the summary of each alternative where they are evaluated to determine how, at the end of cleanup construction, each alternative compares to the residual risk and post-construction risk. Each alternative was evaluated to compare the estimated risks remaining at the end of cleanup construction, as well as when cleanup levels are achieved. The risk remaining once the cleanup level is achieved is called residual risk. Table 22 in Appendix II of the ROD provides the calculated risks at the end of construction for each alternative. Alternatives with smaller SMA footprints have higher risks post construction to human health and the environment, address less groundwater contamination, and include fewer contaminated river banks. Alternatives that have smaller cap/dredge footprints and rely more on MNR have more uncertainty that cleanup levels would be met.

4.2.12 RAO 2, Page 51

Comment
The interim target hazard index for infants is stated as 1,250 on a site-wide scale and 920 on a river mile scale. These targets are inconsistent with the feasibility study report. The infant interim target hazard index in the feasibility study report is 1320 site-wide and 450 on a river mile scale (see feasibility study report Page 4-79).

EPA Response
The interim targets based on the infant nursing exposure scenario were calculated based on the selected PRGs for RAO 2. Residual risk estimates were calculated as presented in Table J1-2 in Appendix J of the feasibility study report (USEPA 2016b). The interim targets were calculated by multiplying the residual risk estimates of 132 (site-wide) and 45 (RM and SDU scale) by 10. The residual risk estimates exceed 1 because many of the PRGs for RAO 2 are not risk-based but rather based on background. Cleanup levels for each RAO will be evaluated against empirical data collected under a robust monitoring plan for the Site.

4.2.13 RAO 5, Page 51

Comment
The interim target for RAO 5 is unclear. Although the text indicates that the interim target for RAO 5 is to address 50 percent of the benthic risk area, this is untrue. The Alternative I footprint addresses only 17 percent of the benthic risk area (225 acres, Table J2.4-1). Although not explained in the text, the

state understands that EPA's interim target is actually based on the area exceeding 10x the benthic risk PRGs. The basis for all interim targets should be clearly described in the text.

EPA Response
Refer LWG Dispute Issue 1b (Appendix A of this document). As shown in Table 22 of the ROD, EPA's selected remedy, Alternative F Modified, addresses 72 percent of the area with unacceptable benthic risks (the area that exceeds 10 times the benthic risk value). The Alternative F Modified achieves the interim target of 50 percent.

Alternative I addresses 64 percent of the area with unacceptable benthic risks (Figure 4.2-29 and Table 4.2-7), which achieves the interim target of 50 percent.

4.2.14 Implementability, Page 56

Comment
The ROD should acknowledge potential impacts of construction on adjacent business and marine-based commerce and consider these impacts in the comparative alternatives evaluation. Alternatives which can be implemented in a shorter period of time will have a shorter duration of impacts.

EPA Response
Because the primary objective of the remedy must be to protect of human health and the environment, economic impacts to businesses are not considered in the CERCLA alternative evaluation and remedy selection process directly or specifically. However, EPA recognizes the goal to limit interference with commercial, industrial, and other uses of the river to the extent possible and will take into consideration those operations and constraints during remedial design. EPA will work with landowners and businesses to minimize economic impacts through the design and implementation of the remedial actions.

4.2.15 Preferred Alternative, Page 64

Comment
The plan calls for placement of an impermeable cap layer (e.g., AquaBlok) beneath structures. This type of cap may be subject to failure and heaving due to tidal influences and surface water-groundwater exchange, resulting in some loss of its isolation capabilities. Other cap materials should be considered and evaluated during design for placement under structures.

EPA Response
As discussed in the first square bullet on Page 64 of the proposed plan (USEPA 2016c), AquaBlok™ was assumed to be a representative material for feasibility study evaluation and feasibility study cost purposes that could be used to reduce cap thickness under structures. However, EPA agrees that other comparable materials could achieve the objectives identified for AquaBlock™ as discussed on Page 64 of the proposed plan could be considered and evaluated during remedial design. The ROD includes "or similar" type language when referring to such proprietary technologies.

The ROD includes a flexible decision tree along with general capping design requirements to guide the assignment of capping technologies, based on specific characteristics within SMAs. The decision tree will be used during remedial design to define what actions should be taken under different environmental conditions and locations based on the most recent design data. Once the data and river factors are evaluated within the context of the decision tree, a final design for construction can be

completed. This design will then dictate the remedial construction. The decision tree is intended to provide clear direction on what actions should be taken under the different environmental conditions.

4.2.16 Preferred Alternative, Page 65

Comment

Aquablok and Aquagate are proprietary products. The use of these products should not be a specific requirement and the ROD should clarify that alternative, comparable products may be used.

EPA Response

As discussed in the first square bullet on Page 64 of the proposed plan (USEPA 2016c), a reactive layer was discussed for use in addressing groundwater plumes where pore water exceeds PRGs. The representative materials discussed as an assumption for the feasibility study report (USEPA 2016b) for evaluation purposes was AquaGate and Aquablok™. However, EPA agrees that other comparable materials that could achieve the objectives of a reactive layer as discussed on Page 64 of the proposed plan could be considered and evaluated during remedial design. The ROD includes "or similar" type language when referring to such proprietary technologies.

4.3 Specific Issues with Figures and Tables

4.3.1 General

Comment

The ROD should provide adequate depictions of the risk areas to be addressed by the remedy.

EPA Response

The feasibility study report (USEPA 2016b) has depictions of the RAO 5 risk areas addressed with each of the alternatives as shown in Figures 4.2-19, 4.2-21, 4.2-23, 4.2-25, 4.2-27, 4.2-29. A similar figure will be developed for the final chosen alternative and presented in the ROD. It should be pointed out that these areas will change as new data are gathered.

4.3.2 Figure 6

Comment

The river banks identified as contaminated in this figure should be revised to be consistent with the areas identified in the Portland Harbor Upland Source Control Summary Report March 25, 2016.

EPA Response

See River Banks Theme 10: "The completeness of river bank contaminant delineation and the need for an action to address river bank soil will be evaluated during remedial design."

4.3.3 Figure 10a

Comment

This figure assumes that no PTW or RAL exceedances occur greater than 18 feet bml in FMD areas or 15 ft bml in the navigation channel. It is unclear whether these depths define the maximum dredge depths in these areas, or if dredging will extend to the full depth of PTW/RALs should new data indicate deeper exceedances.

EPA Response

Section 14.2.9.1 of the ROD states "If caps are required within the navigation channel and future maintenance dredge areas, work will be coordinated with USACE to ensure that the cap is compatible

with current and anticipated waterway use. Any proposed capping in the navigation channel and future maintenance dredge areas will consider the current and authorized channel depth, the potential for an increase to the currently authorized channel depth, future navigation and maintenance dredging, and an appropriate buffer depth to ensure the integrity of the cap." Section 15.2.3 of the ROD further states "Contaminated sediments located in the navigation channel are assumed to be dredged and then a residuals management layer will be placed in the dredged area. The Willamette River currently has an authorized channel depth of -40 ft CRD. Prior to listing of the Portland Harbor Superfund Site on the NPL, the USACE proposed deepening the federally maintained navigation channel to -43 ft CRD.

Contamination at depths greater than the authorized depth of the navigation channel may be capped and those caps will be constructed below the authorized depth of dredging so as not to interfere with future dredging as well as to provide an overdredge allowance or buffer zone, as necessary, to protect the remedy from future dredge activities."

4.3.4 Figure 10b

Comment

The multi-criteria design matrix (feasibility study report Figure 2.4-16) is necessary to interpret the intermediate area technology assignments. This matrix should be included and discussed in the ROD. This discussion should include a summary of the weighting and scaling approach used for various elements and should also acknowledge the dependence of the evaluation on assumptions such as the choice of cutoff criteria and the scale, and use equal weighting of factors on the resulting matrix designation. Alternatively, and preferred by the state, is that a preference not be specified between dredging versus capping in intermediate areas.

EPA Response

The decision tree used in the feasibility study report (USEPA 2016b) is not used in the ROD. Instead a more simplified and flexible decision tree is used and should address the above question. See Section 2.24 of this responsiveness summary for a detailed response on the use of assignment criteria and how dredging and capping will be addressed.

4.3.5 Figure 19c

Comment

Alternative I identifies dredging as the remedial technology for the portion of Terminal 4, Slip 3 which was capped as part of the T-4 Phase I Removal Action. The ROD should either amend the figure if the assigned technology is in error or explain why the cap should be removed.

EPA Response

There is a small cap at the head of Slip 3 as shown in the Phase 1 Removal Action (2008 Anchor QEA). The technology assignments presented in the feasibility study report (USEPA 2016b) are representational and do not determine the final applications. The state of currently capped areas will be taken into account during final remediation design.

Comment

Beach sample locations adjacent to the Mar-Com North and South Parcels7 indicate that PCBs in excess of the Alternative I RAL extend into the cove area outside of the Alternative I footprint shown in the figure.

EPA Response
Only sediment samples were used in the site evaluation. River bank and beach samples were not included. Final technology assignments will be evaluated based on new data and sampling collected during the remedial design phase. There will be an opportunity to decide on whether or not to include additional sample data and how best to evaluated it.

4.3.6 Table 11 – PRGs

Comment

- The table title and headers should distinguish between PRGs (sediment) and target values which will be used as a measure of progress (surface water, groundwater, fish/shellfish tissue).
- The groundwater PRG value of 2.6 µg/L for TPH-Diesel should be clarified as applying to the aliphatic EC10-EC12 fraction of TPH.
- The fish tissue values apply to both fish and shellfish.

EPA Response
EPA has revised the RG table in the ROD to distinguish between cleanup levels for RGs for surface water, groundwater and river bank soil/sediment and target levels for fish tissue. Target levels for fish tissue are generally based on fish consumption because the shellfish consumption rates are much lower than the fish consumption rates. The exception to this is cPAHs which has fish tissue target level of 7.1 µg/kg, based on a shellfish consumption rate of 3.3 grams per day. EPA has also clarified that the RG for TPH diesel in sediment is 91 milligrams per kilogram (RAO 5) and the PRG for C10 – C12 aliphatic hydrocarbons is 2.6 micrograms per liter (RAO 8).

The groundwater PRG of 2.6 micrograms per liter should be for C10 – C12 Aliphatic hydrocarbons and not TPH diesel. There is a PRG of 91 milligrams per kilogram for TPH-Diesel in sediment (RAO 5).

The shellfish consumption rates are much lower than fish. Fish and shellfish were evaluated separately. In general, the RAO 2 PRGs are based on fish consumption. The exception to this is the cPAH PRG which was based on clam consumption.

Section 5

National Marine Fisheries Service Comments and Responses

5.1 General Comments on the Proposed Plan

5.1.1 Consider Impacts to Trust Resources

Comment

"NMFS is concerned with potential impacts of the proposed plan to our trust resources, specifically:

a. Habitat modification in the Harbor, changes in prey availability, and bioavailability and bioaccumulation of COCs in the prey species of out-migrating juvenile salmon and steelhead are all important threats to these species.

b. Marine mammal species, particularly southern resident killer whales, feed on salmon from the Columbia River system. Because of the bioaccumulative nature of many of the COCs addressed in the proposed plan, potential short-term increases in bioavailability of COCs in the Harbor represent a risk concern for these species.

c. Southern DPS green sturgeon is particularly susceptible to short-term increases in bioavailability of COCs.

d. Southern DPS eulachon in the Columbia River are susceptible to impacts to prey availability and increased bioavailability and bioaccumulation of COCs in their prey.

e. An increase in the migration of COCs to the estuary represents a potential risk to Essential Fish Habitat (EFH) for coastal pelagic and groundfish species."

EPA Response

EPA appreciates NMFS' comments on the proposed plan (USEPA 2016c) and draft Programmatic Biological Assessment. EPA will continue to coordinate with NMFS to evaluate impacts on listed species and designated critical habitat. The Programmatic Biological Assessment outlines the best management practices and other measures to be implemented to avoid or minimize impacts. Additional species noted above will be added to the next version of Programmatic Biological Assessment sent to NMFS for review.

5.1.2 Address Impacts of Disturbed Sediments on Salmon and Steelhead

Comment

"Direct disturbance of sediments in the Harbor, either through dredging or capping, are likely to adversely affect Endangered Species Act-listed salmon and steelhead, depending on where such activities occur in the channel profile. The river regions identified by EPA do not correspond to the ecological significance certain areas have to specific species. Specifically:

- Loss of active channel margin (ACM) and shallow water habitat (SWH) due to bank.
- Armoring, development, channelization, and fill within the historic ACM and floodplain are key factors limiting the recovery of some Endangered Species Act-listed species in the Lower Willamette River (LWR) and Harbor.
- ACM refers to the part of the river's edge that occurs at the interface of unwetted shoreline and shallow water, and occurs from ordinary high water (OHW) to ordinary low water (OLW).
- SHW refers to areas from the water's edge out to a maximum depth of 15 feet below OLW.
- This corresponds with part or all of the following river regions identified in the proposed plan: Intermediate Region, Shallow Region, and River Bank Region.
- The proposed plan is likely to result in significant disturbance of ACM and SWH areas because the proposed plan emphasizes dredging and capping in the Shallow Region and River Bank Region to avoid changes in river flood storage and to comply with no net rise requirements.

NMFS strongly recommends further consideration of the remedial actions proposed for ACM and SWH habitats, including limits on sediment disturbance and conversion of such habitat from submerged to submersible lands, e.g.:

- i. Reducing the repose of shorelines and removal of streambank fill to expand the floodway and active channel.
- ii. More stringent work area isolation measures when dredging in shallow water habitats.
- iii. Provision of more a substantial "beach mix" to provide a habitat layer to enhance recovery of this key habitat type, e.g., (1) a mix of screened and washed 2.5-inch minus gravels (no fines) mixed with sand; and (2) use of a carbon-amended "beach mix" for broader expanse of ENR areas.

Because of the very high value of these areas for the survival and recovery of Endangered Species Act-listed species, NMFS favors ENR treatments over MNR in these areas."

EPA Response

EPA acknowledges the ecological importance of ACM and SWH areas. To avoid or minimize impacts on ACM and SWH areas, the feasibility study report (USEPA 2016b) Appendix L describes the following measures:

- Following dredging in shallow water areas (0 to 20 feet from ordinary low water), backfill would be used to restore the existing (pre-dredging) elevation to avoid loss of shallow water habitat.
- To offset permanent and/or temporal loss of habitat functions from dredging and capping in shallow water areas and as on-site mitigation, following dredging and capping in shallow water areas, slope would be laid back or the slope otherwise lessened to as close the existing slope as practicable given site-specific conditions.
- To further offset permanent and/or temporal loss of habitat functions from dredging and capping on river banks and as on-site mitigation, after soil removal on river banks, river bank

slopes would be laid back to as close as a 5H:1V slope as practicable given site-specific conditions.

- Capping in shallow areas would specify dredging of an equivalent cap thickness prior to placement to allow for a net zero bathymetry change and avoid loss of shallow water habitat.
- Engineered beach mix layer consisting of rounded gravel typically 2.5 inches or less as well as sand would be applied to the uppermost layer of all caps and dredge leave surfaces in shallow areas. This layer would provide appropriate substrate habitat for colonization by benthic organisms. Beach mix would not be applied to leave surfaces consisting of sand unless required due to changes in hydrodynamic conditions following remedial activities to ensure the layer will be stable over time. In addition, if beach mix is placed over riprap armoring, monitoring would be required to determine whether the site-specific conditions are conducive to maintaining the beach mix habitat layer over the riprap. If monitoring, test plot pilot study, or site-specific modeling demonstrate that a sand/gravel surface can be maintained long term, this may be considered by EPA when determining if the compensatory mitigation proposed during remedial design is adequate. Coordination will be ongoing with the Services regarding treatment material compatibility with habitat.
- Vegetation would be incorporated into caps placed on river banks where possible such as in off-channel areas that are not prone to erosion and with less steep slopes.

EPA will coordinate with NMFS during remedial design to refine the selection of construction methods and the measures for protection of listed species and aquatic habitat.

5.1.3 Conduct Reach-Wide Sediment Sampling in Lower Willamette River

Comment

"Sediment sampling and characterization. Before starting remedial activities, NMFS recommends repeating the reach-wide sediment sampling for the LWR, originally conducted in 2008 and analysis of the data collected to:

- Ascertain if MNR is observable at the decadal timeframe.
- Better assess upstream contributions to the LWR.
- Improve our understanding of sediment and contaminant mobility."

EPA Response

The remedial technology assignments described in the proposed plan (USEPA 2016c) were based on contaminant concentrations and physical conditions such as areas of erosion/deposition, infrastructure such as docks and piers, and land and waterway use. During remedial design, detailed area-specific studies will be conducted to determine existing baseline conditions, including levels of contamination and to design how the cleanup will be conducted before the construction begins. Baseline sampling will include areas upstream and downstream of the Site.

5.1.4 Address Concerns About the CDF

Comment

NMFS remains concerned about the inclusion of the confined disposal facility (CDF) in the proposed action, both from the standpoint of the loss of 15 acres of aquatic habitat (including 3+ acres of shallow water and off-channel habitat), and from the long-term disposition of the facility.

- How will wastes that do not meet disposal requirements for the CDF be separated from wastes that meet CDF disposal criteria, particularly for dredge units where such COCs may be adjacent, co-mingled, or layered?
- What seismic design requirements will be applied to the CDF, and to armored and engineered caps?
- If soluble contaminants will be placed in the CDF, what additional design considerations are necessary to isolate the CDF from the aquatic environment (e.g. slurry wall, impermeable lining, impermeable cover, a pump-and-treat system to remove these COCs)?
- On the other hand, if soluble contaminants will be excluded from the CDF, how will such COCs be adequately excluded from the waste stream identified for CDF placement?
- How will EPA ensure that any loss of ACM and SWH will be off-set?

EPA Response

A CDF is no longer being considered as part of the remedy.

5.1.5 Explain Treatment of ARARs

Comment

Please explain how EPA will determine which ARARs it will either attain or waive as part of the proposed remedy.

EPA Response

As stated in Section 2.1.1 of the feasibility study report (USEPA 2016b), EPA does not currently have a basis for waiving any ARARs. Any ARAR waivers would have to be supported by a technical impracticability analysis or other ARAR waiver basis and documented in a ROD amendment. Section 12.2 of the ROD identifies the ARARs that will be met.

5.1.6 Use Rock and Gravel Instead of AquaBlocks

Comment

The preferred alternative indicates a preference for AquaBlocks for use as a sediment cap because these structures achieve greater armor protection in a thinner profile depth. However, NMFS does not support use of AquaBlocks and prefers rock and gravel armor layers, even if doing so results in additional dredge depth.

EPA Response

AquaBlok® is a patented, composite-aggregate technology resembling small stones and typically comprised of a dense aggregate core, clay or clay-sized materials, and polymers. It is used as an impermeable material for remedial sediment caps, not for armor protection. NMFS may be referring to concrete block structures (such as those used at the McCormick and Baxter site) that could be used instead of rock or gravel armor. EPA agrees that rock and gravel armor layers would be preferable

over concrete block structures and will further coordinate substrate specifications with NMFS during design.

5.2 Comments on the Programmatic Biological Opinion

5.2.1 Define ACM and SWH

Comment

"The definition of ACM and SWH should be defined throughout the PBA as noted above. The definitions provided in this letter are consistent with what the Portland Harbor Trustee Council (PHTC) is considering as SWH for their restoration projects in Portland Harbor, and with the definitions that NMFS will use to analyze the effects of the proposed plan on Endangered Species Act-listed species."

EPA Response

Comment noted. EPA will revise the PBA accordingly.

5.2.2 Ensure Material Placed for Habitat Purposes is Stable over Time

Comment

NMFS is concerned about the long-term stability of any "fish friendly" layers that may be placed over sediment in the Harbor as part of the proposed plan. The PBA should make clear that any sand or "beach mix" layer that is placed for habitat purposes must stable over time, including use of reduced slopes as necessary.

EPA Response

Comment noted. Stability of the beach mix layer will be evaluated during remedial design and subsequent monitoring.

5.2.3 Consider Beach Mix or Sand Covers as a Minimization Measure

Comment

"Beach mix" or sand covers should be considered as a minimization measure outside of shallow water habitat as well to reduce mitigation requirements in deeper water and bank areas.

EPA Response

Comment noted. Beach mix or sand covers will be considered as a minimization measure in deeper water and bank areas.

5.2.4 Define Criteria for Measuring MNR Success

Comment

In Section 2.3.2, please define the criteria that EPA will use to determine whether MNR is successful or not, and thus whether additional active clean-up will be required. This must include the number of years beyond the seven years of construction that will elapse before making this determination.

EPA Response

Following construction, there will be long-term monitoring until the cleanup levels and associated RAOs are achieved and beyond. A monitoring plan will be developed during remedial design and incorporated into the PBA. Data on contaminant levels will be used for multiple purposes, such as to determine if MNR is taking place as expected or if any additional actions are required to achieve the

cleanup goals on the planned timeline. EPA will coordinate with NMFS on the progress on achieving remedial cleanup levels and achieving RAOs over time and if any additional actions might be needed to achieve them. Impacts of any additional measures will be coordinated with NMFS and supplements provided for the Biological Assessment, if needed.

5.2.5 Address Concerns with Loss of Habitat and Structural Integrity

Comment

As noted above, NMFS remains concerned about the inclusion of the CDF in the proposed action, both from the standpoint of the loss of aquatic habitat and structural integrity in a large seismic event. If the CDF is constructed, it should meet all water quality criteria at the point of discharge.

EPA Response

A CDF is no longer being considered as part of the remedy. The PBA will be revised accordingly.

5.2.6 Provide Details of Safe Fish Handling

Comment

Since the collection of biota for tissue sampling for MNR will likely harm or injure some salmon and steelhead, we will need more details on this procedure in the PBA such as number of sampling design, procedures for safe fish handling.

EPA Response

Comment noted. A detailed fish sampling plan will be included in future monitoring plans. EPA will coordinate with NMFS as details of the monitoring plans are developed.

5.2.7 Fix Non-Lower Willamette River Issues in Avoidance and Minimization Measures Section

Comment

The impact avoidance and minimization measures section seems to include some measures that, as currently worded, do not appear to apply to the LWR.

EPA Response

Comment noted. The impact avoidance and minimization measures section will be revised to omit measures that do not apply to the LWR.

5.2.8 Work with NMFS to Develop a Refined List of Pile Removal Practices

Comment

Some methods of pile removal proposed in the PBA, such as clamshell extraction, may cause more adverse impacts than leaving the pile in place. Please work with us to develop a more refined list of pile removal BMPs to include in your final PBA.

EPA Response

Comment noted. EPA will work with NMFS to refine the list of pile removal BMPs in the PBA and remedial design documents.

5.2.9 Refine the Description of the Action Area

Comment

Please refine the description of the action area to include all areas where contaminants may disperse downstream, areas that may be used for compensatory mitigation projects, and areas that will be used as shipping facilities or affected by ship traffic or other actions necessary to transport contaminated sediment to its eventual landfill destination. Also, note that additional impact avoidance and minimization measures may be necessary for the safe upstream transportation and handling of contaminated sediments.

EPA Response

Comment noted. EPA will work with NMFS to refine the description of the action area per NMFS' comment and to consider impact avoidance and minimization measures necessary for the safe transportation and handling of contaminated sediments.

5.2.10 State That Mitigation Will Occur as Close to Impact Area as Possible

Comment

NMFS has not yet determined whether to approve compensatory mitigation projects outside of the Portland Harbor Site, either upstream in the Willamette River or downstream in the Columbia River. NMFS will strongly prefer mitigation to be as close to the impact area as possible, and would appreciate this being explicitly stated as a preference in the PBA as well.

EPA Response

Comment noted.

5.2.11 Describe Compensatory Mitigation Process

Comment

The Programmatic Biological Assessment should mention the likely option of credit purchases from approved mitigation banks as an alternative to applicants constructing their own compensatory mitigation projects. In addition, compensatory mitigation would not just involve converting upland to shallow water areas as is stated in the PBA in several places.

EPA Response

Comment noted. EPA will revise the Programmatic Biological Assessment to mention credit purchases from Clean Water Act 404 approved mitigation banks as an alternative to applicants constructing their own compensatory mitigation projects. EPA will coordinate with NMFS as specific compensatory mitigation projects are proposed but at this time are not prepared to eliminate any potential "enhancement" or "creation" mitigation projects that converting upland to shallow water may meet under the Clean Water Act.

5.2.12 Discuss Effects of All Contaminants that Would Impact Salmon and Steelhead

Comment

Why are the effects of only certain chemical groups on salmon and steelhead discussed in the PBA? Are these the only ones expected to be mobilized so that salmon and steelhead are exposed during the

proposed action? The Programmatic Biological Assessment should discuss effects of all contaminants that would likely impact salmon and steelhead during remedial actions.

EPA Response
As described in Section 5.1.1.1 of the Programmatic Biological Assessment, the BERA (Windward 2013) found that the potential acute exposure of contaminants during dredging at the Site is likely associated with the three chemical groups evaluated in the PBA: PAHs, PCBs, and DDx compounds. The revised Programmatic Biological Assessment will incorporate additional information, as needed, on the effects of these and other contaminants that could be mobilized and effect listed species.

5.2.13 Consider Impacts of Large Ship Wakes

Comment
Please consider the impact of large ship wakes as part of the determination of where caps will likely have to be armored, and where "beach mix" is likely to stay in place. Otherwise, EPA is likely to underestimate the amount of compensatory mitigation required for armored caps in the Harbor.

EPA Response
Comment noted. Remedial design investigation will consider the impact of large ship wakes as part of the determination of where caps will need armoring and how wakes would affect the stability of the beach mix layer.

5.2.14 Address Dispersion of Contaminants During Remedial Dredging

Comment
Please include any information available on the dispersion of contaminants during remedial dredging, e.g., studies that show the likely concentration, fate and transport of contaminants that will disperse downstream during clean-up operations.

EPA Response
Comment noted. The draft PBA included information on the dispersion of contaminants (see Section 5.1.1.1 of this responsiveness summary) and suspended sediment during dredging (see Section 5.1.1.2 of this responsiveness summary). The revised PBA will include additional information, if available, on the dispersion of contaminants during remedial dredging and other remedial activities.

5.2.15 Refine the Description of the Action Area

Comment
Table 5.3 and Section 5.4.2 state that the proposed action "would adversely modify" critical habitat for LCR coho salmon. Please note that the correct determination here is the same as for the other Endangered Species Act-listed species.

EPA Response
Comment noted. The PBA will be revised with the correct determination.

5.2.16 Consider Bioaccumulation Impacts in Killer Whales

Comment
For the killer whale effects determination, the PBA states that transport of contaminants from the Site to the LCR would be negligible so salmonid prey of killer whales would be unlikely to be exposed to resuspended contaminants. However, that does not acknowledge that some prey of killer whales

would likely be exposed to contaminants during the clean-up, and the fundamental role that bioaccumulation of contaminants in the killer whale's food web play in limiting its recovery.

EPA Response
Comment noted. The evaluation of killer whale effects will be revised to include consideration of prey that is exposed during the cleanup and the role of bioaccumulation of contaminants in limiting the recovery of the species.

5.2.17 Consider Vessel Strikes on Whales

Comment
Widespread dredging and capping will require the mobilization of equipment from outside the local area. Vessel strikes on whales by equipment moved from Seattle/San Francisco/Long Beach should be considered in the section on interrelated and interdependent actions.

EPA Response
Comment noted. The evaluation of killer whale effects will be revised to include consideration of vessel strikes by equipment from outside the local area.

5.2.18 Discuss Capture of the Proposed Plan in the Biological Opinion

Comment
Finally, we need to discuss how the proposed plan can be captured most effectively and efficiently in a biological opinion.

EPA Response
Comment noted. EPA looks forward to continued coordination with NMFS in development of the PBA and any supplements and biological opinions on remedial actions.

Section 6

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Appendix A

PRP Dispute Resolutions for June 2016 - Legacy Site Services, Lower Willamette Group, Union Pacific Railroad

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Re: Portland Harbor Superfund Site Final Feasibility Study Dispute Decision

Dear Sirs:

This memorandum resolves three disputes related to EPA's final Feasibility Study ("Final FS") for the Portland Harbor Superfund Site. The disputes were initiated by several but not all Respondents to the administrative order on consent entitled *In the Matter of: Portland Harbor Superfund Site*, Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study, U.S. EPA Docket Number CERCLA-10-2001-0240 (the "AOC") and dated October 23, 2001 [1]. Arkema, Inc., Chevron U.S.A., Inc., Evraz Inc., N.A. Gunderson L.L.C., NW Natural, TOC Holdings Co., and Union Pacific Railroad Company (collectively the "Lower Willamette Group" or "LWG"); Legacy Site Services ("LSS") the agent for Arkema, Inc.; and the Union Pacific Railroad ("UPRR") initiated the LWG, LSS, and UPRR disputes by letters of June 22, 2016. Specific responses to each issue raised in the disputes are included in Appendix A.

[1] The signatories to the RI/FS AOC include Atofina Chemical, Inc., Chevron USA, Inc., Gunderson, Inc., Northwest Gas, City of Portland, Port of Portland, Time Oil Co., Conoco Phillips Company (formerly Tosco Corporation), Union Pacific Company, and Oregon Steel Mills, Inc.

LWG requests the following determination:

1. EPA's June 2016 FS should not be used as the basis for a Record of Decision ("ROD") for the Portland Harbor Superfund Site.

2. The alternatives analysis in the LWG's 2012 FS provides an adequate basis for selecting a remedy at the Site.

3. LSS requests that EPA make several modifications to the Final FS as documented in its letter of dispute.

4. UPRR requests a determination that several elements of the Final FS fail to comply with the National Contingency Plan ("NCP"), 40 C.F.R. Part 300, and EPA's designation of principal threat waste ("PTW") at the Site.

By this memorandum I deny all relief requested in the June 22, 2016 letters of dispute. In so doing, I specifically determine that the EPA's FS is compliant with CERCLA and the NCP, and provides an appropriate basis for selecting a remedy in a ROD for the Portland Harbor Site.

Context

The FS disputes arise from EPA's decision of January 4, 2016 to finalize the FS for the Portland Harbor Superfund Site and to relieve the LWG of its obligation to complete performance of the FS. By letter of January 19, 2016, LWG disputed EPA's decisions regarding the FS and requested that EPA withdraw its letter. This dispute was resolved by an agreement of February 4, 2016 (the "February 4 Agreement") whereby LWG and EPA agreed, in relevant part, as follows:

1. The EPA will finalize the FS.

2. The LWG AOC signatories may dispute the Final FS produced by the EPA by submitting their dispute within 14 days of publication of the Proposed Plan.

3. The AOC dispute process would proceed directly to a formal determination by the Director of the Region 10 Office of Environmental Cleanup.

4. LWG's dispute statement will be placed in the administrative record and the dispute process will be conducted consistent with requirements for public participation for the proposed remedy decisions under CERCLA, the NCP, and federal law.

The EPA and LWG also anticipated that the determination resolving the dispute would be issued simultaneously with EPA's remedy decision after considering all public comments along with the disputed issues.

Prior to making this determination, I have reviewed materials I have received from the LWG, LSS, UPRR, and the EPA Portland Harbor Team that responded to the LWG, LSS and UPRR dispute

positions. These materials have also been placed in the administrative record that supports this Decision and in the Portland Harbor ROD Administrative Record.

Scope of Dispute

The materials submitted and relied upon in the disputes are voluminous. EPA's position paper (Appendix A) which includes the LWG, LSS, and UPRR dispute positions, identifies and responds to over 50 issues. As an initial matter, I will streamline the dispute issue by addressing what issues are within the scope of the FS dispute. The February 4 Agreement allowed the LWG signatories to dispute the "Final FS." Issues related to EPA's decisions made prior to issuance of the Final FS (including those that have been resolved through the AOC's dispute resolution process or those relating to changes between EPA' draft 2015 FS and the Final FS) and the Proposed Plan are outside the scope of the February 4 Agreement and not subject to dispute.

In addition, a decision to exclude such issues from dispute is consistent with the AOC. This conclusion is supported by at least two sections of the AOC. The first is Section XII (Final RI/FS, Proposed Plan, Public Comment, Record of Decision and Administrative Record) of the AOC. In this section EPA, appropriately, retained the responsibility for preparing and releasing the Proposed Plan and Record of Decision. The second is Section XVIII (Dispute Resolution) of the AOC. Paragraph 1 of this section expressly limits disputes to activities or deliverables required under the AOC, prohibits disputes not initiated within 14 days of the disputed EPA decision, and renders a dispute resolution decision final (not subject to further review). Thus, the issues not related to the 2016 FS are dismissed without further discussion.

Discussion

The LWG, LSS and UPRR collectively dispute nearly every aspect of the Final FS. They frame the issues within the rubrics of EPA's failure to comply with CERCLA, the NCP, and relevant EPA guidance; EPA's use of inadequate technical methodologies resulting in unsupportable determinations; or EPA's reliance on flawed data or assumptions, or conversely failure to rely on the right data or assumptions. Thus, and by way of illustration, the EPA is faulted for concluding that certain alternatives are not protective of human health and the environment or compliant with ARARs; exaggerating site contaminant risk, including those posed by eating fish; failing to recognize that upstream sediments are naturally covering up risks posed by contaminated sediment within the Site; ignoring, conversely, the potential for recontamination from upstream sources of contamination; determining incorrectly the types and amounts of PTW within the Site; underestimating the short terms effects of dredging while over-estimating the long-term benefits of cleanup, including erroneous assumptions about location and volume of waste subject to potential remedial action; relying on erroneous cost assumptions and underestimating the cost of remedy implementation; and ignoring the effect of source controls undertaken under the oversight of the Oregon Department of Environmental Quality ("ODEQ").

EPA's response addresses the dispute issues by clarifying misplaced suppositions that underlie Disputants' position, or by articulating a disagreement regarding the application of best professional judgment, or a combination of the two. EPA's response demonstrates that the EPA considered the relevant facts and drew logical conclusions from those relevant facts. Disputants may and do disagree with those conclusions, but EPA's conclusions are rationally related to the relevant facts and the product

of analysis based upon the EPA's experience of addressing widespread contamination at other sediment sites and sound scientific principles. Below are specific references to issues raised by the Disputants and the EPA's response which are illustrative of the information that supports my conclusion.

The LWG frames its first issue as follows: "EPA's conclusions that certain alternatives are not protective or fail to comply with ARARs are based upon evaluations that are inconsistent with the approved remedial investigation and baseline risk assessments and fail to apply appropriate risk management principles." In its response to this issue, the EPA addresses several sub-issues (LWG Dispute Issues 1a through 1s), and identifies where the LWG is mistaken, and where and why the EPA appropriately used its best professional judgment in a manner supportive of this decision. Some examples of EPA's responses to LWG Dispute Issue 1 include the following:

1. The EPA's response to LWG Dispute Issue 1a, which, among other things, describes why alternatives B and D are protective of human health[2] but are not protective of the environment; and unlike the Baseline Ecological Risk Assessment (BERA), LWG's proposed Comprehensive Benthic Risk Approach was disapproved by the EPA on December 18, 2012.
2. The EPA's response to LWG Dispute Issue 1b, which, among other things, describes how the EPA's approach to managing benthic risk "honors" data and information developed during the Remedial Investigation/Feasibility Study ("RI/FS"), and intends to protect local benthic populations.
3. The EPA's response to LWG Dispute Issue 1c, which, among other things, describes how EPA used surface weighted average concentrations (SWAC) in the Final FS. This approach addressed issues raised by EPA's National Remedy Review Board and EPA's Contaminated Sediment Technical Advisory Group. In addition, the approach EPA used in the Final FS provides a more realistic approach in managing risk than the approach proposed by the LWG in that the EPA's approach is consistent with the exposure of smaller range fish species that reside within the Site and takes into consideration the range within the Site these fish likely use.
4. The EPA's response to LWG Dispute Issue 1d, which, among other things, notes, in response to a complaint of the EPA's inappropriate reliance on aggregated data, that the EPA aggregated the same data as the LWG did in the draft FS it submitted to EPA in 2012, further describes the use of SWACs for evaluating alternatives during the Final FS, describes the use of interim goals as part of EPA's evaluation of long-term effectiveness by comparing post-construction risks to residual risks left if PRGs are met, and explains how site-specific considerations were sensibly used to develop remedial actions levels (RALs) to evaluate residual risk and allows the EPA to evaluate different arrays of cleanup actions and discern the relative cost-effectiveness each provided in risk reduction as part of the Final FS alternative analysis.
5. The EPA's response to the LWG Dispute 1m, which, among other things, describes how the EPA identified contaminants of concern (COCs) for surface water, informs why the identified surface water COC determinations are consistent with the CERCLA and the NCP, and explains why maximum contaminant levels (MCLs) established under the Safe Drinking Water Act are applied to pore water (both groundwater and surface water within the Site are potential sources of drinking water and pore water is representative of the pathway between the two).
6. The EPA's response to the LWG dispute 1q, which, among other things, explains why the EPA evaluated alternatives to address river bank contamination in the Final FS. In its explanation, the EPA notes the obvious, that contaminated river banks may be the source of a continuing release of

[2] The Portland Harbor Superfund Site ROD notes that alternative B and D may not be protective of human health since certain ARARs they may not attain are developed to be protective of human health.

hazardous substances into the waterway which may exacerbate existing contamination and re-contaminate remediated areas if not addressed, and describes the role of the ODEQ in EPA's decision to evaluate river bank contamination. The EPA also notes that it retains the authority to evaluate source control efforts undertaken under the oversight of ODEQ and that the Memorandum of Understanding between EPA and ODEQ does not preclude the EPA from exercising its authority.

7. The EPA's response to LWG Dispute Issue 1r, which among other things, describes the EPA's evaluation of post-construction equilibrium, and explains why, based on sediment trap data indicative of upstream sediment inputs and source control efforts, the EPA does not believe that remediated sediments will be re-contaminated.

The LWG's second issue argues that "EPA's June 2016 FS continues to lack complete and transparent evaluation of the long and short-term effectiveness of the alternatives, as well as the degree to which implementation of those alternatives will reduce the toxicity, mobility, or volume of hazardous substances, including through treatment of material it has labeled [PTW]." In response to the second issue, the EPA identifies and responds to numerous sub-issues, and in its response EPA, again, demonstrates that the LWG is either mistaken or that the EPA appropriately used its best professional judgment to address technical issues. Examples of responses include:

1. The Final FS relies on the conceptual site model developed in the RI report (which is not a subject of the Final FS disputes and was developed by LWG) and the Final FS provides the appropriate level of information related to the extent of contamination for the purpose of identifying and evaluating remedial alternatives. In addition, the EPA notes that the *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (2005), at pages 2-39 through 2-40, cautions against the use of models that cannot be calibrated and validated at the space and time scales associated with the questions the model must answer.
2. EPA also notes that the Disputants failed to develop, and have acknowledged their failure to develop, a calibrated and validated fate and transport model that could be used to evaluate post-clean up effectiveness of different remedial alternatives.
3. EPA explains how its alternative analysis was both qualitative and quantitative.
4. EPA describes the role of cost-effectiveness in a feasibility study as the development and inclusion of information in a feasibility study that supports a cost-effectiveness determination when the remedy is selected, and how the Final FS includes the required analysis that supports a later determination of cost-effectiveness.
5. EPA describes the approach used for evaluating contaminant reductions in surface water that would result from implementation of the alternative remedial approaches, and explains why the assumption to subtract out upriver and downtown sources of contamination when evaluating alternative performance on reducing surface water contaminant concentrations is reasonable for the purpose of evaluating the effectiveness of different remedial approaches on post-cleanup surface water concentrations.
6. EPA acknowledges releases of dredged materials will occur during cleanup, estimates the released amount will equal approximately 1% of the dredged materials, and persuasively explains that this estimate is based on information developed during Phase 2 of the Hudson River project, and assumes use of best management practices that were developed for Phase 2 of the Hudson River project.

The Disputants raise and EPA responds to several issues related to cost assumptions used during the alternatives analysis. EPA's response includes, among other things, the following:

1. An explanation that the Final FS cost estimates were developed consistent with EPA guidance, *see A Guide to Developing and Documenting Cost Estimates During the Feasibility* Study (July 2000), for the purpose of comparing remedial alternatives estimates and that the estimates EPA uses in the Final FS fit within the necessary +50 to -30 per cent range of actual costs.
2. EPA identifies cost components the Disputants believed were missing (e.g., multipliers that account for pre-design, initial condition assessment, and agency oversight, and the cost of water treatment associated with dredging).
3. EPA explains why economies of scale associated with a large cleanup likely result in lower assumed rates for certain categories of costs (e.g., contingencies, project management, project design, or the mobilization/demobilization cost multiplier).
4. EPA provides examples of when it used the same cost assumptions as those used to support the LWG 2012 draft FS (e.g., alternative specific costs for purchasing, installing and removing sheet pile walls as well as the unit cost allowance for environmental monitoring during offloading at a transload facility).
5. EPA explains the basis for assumptions that are relevant to cost and differ from those that the Disputants supported, e.g., dredging production rates, the discount rate used to calculate present value of the evaluated remedial alternatives, and the volume of PTW requiring treatment.

Each of the disputes raise issues related to EPA's treatment of PTW in the Final FS. The Disputants argue that EPA's approach to PTW is inconsistent with guidance because it designates as PTW areas with "relatively low concentrations of contaminants of concern" based primarily on EPA evaluation of risks posed by the consumption of fish caught at the Site, because it includes as PTW wastes that can be reliably contained, or because it incorrectly designates listed wastes. EPA responses on this subject articulate a well-reasoned application of professional judgment in its application of Site-specific considerations and relevant EPA guidance. EPA's responses include the following:

1. EPA notes the NCP at 40 C.F.R. § 300.430(a)(1)(iii)(B) specifies a preference for treating PTW whenever practical, and that the relevant EPA guidance, see, *A Guide to Principal Threat and Low-Level Threat Wastes* (Superfund Publication 9380.06FS, November 1991 at p. 2) provides that PTW "are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur."
2. EPA interprets, consistent with EPA practice, the above quoted language to create two categories of PTW. The first includes highly toxic source materials. The second encompasses source materials that are highly mobile that generally cannot be reliably contained or would present significant risk to human health or the environment should exposure occur.
3. EPA explains that its site-specific determination of highly toxic PTW at the Site includes several individual contaminants -- PCBs, cPAHs, DDx, and dioxins/furans (2,3,7,8-TCDD, 2,3,7,8-TCDF, 1,2,3,7,8-PeCDD, 2,3,4,7,8-PeCDF, and 1,2,3,4,6,7,8-HxCDF) – that above specified concentrations in sediment pose a 1×10^{-3} risk for cancer from eating fish caught within the Site and the toxicity values are based on information developed during the baseline human health risk assessment and its application of the food web model (FWM).

4. EPA evaluated several contaminants of concern for the purpose of determining whether they should be treated as PTW under the second prong of the PTW definition; and EPA made a site-specific determination that PTW also included non-aqueous phase liquid (NAPL) in the form of naphthalene associated with MGP waste and chlorobenzene, since naphthalene/MGP and chlorobenzene NAPL cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.

Last of all, I will address concerns related to remedy implementation. These concerns are not within the scope of the disputes at issue but appear important to the Disputants and suggest that the Disputants mistakenly concluded that the Final FS identified the areas of contamination that will be subject to remediation and how each area would be remediated.

The Final FS relies on a large body of information developed during the RI/FS which provides an appropriate basis for identifying and evaluating remedial alternatives. However, and as noted by the EPA in its dispute response, the relied upon information was not developed with the intent to direct remedy implementation actions. Instead, the EPA used the information to support remedy selection by developing remedial alternatives for evaluation pursuant to CERCLA and the NCP's remedy selection criteria. In so doing, EPA, based on the best available information, made assumptions about the location of contamination and how it would be addressed. There is nothing unusual about EPA's approach in this instance. In almost every remedial cleanup the information developed during the RI/FS is supplemented by information that is developed post-ROD through remedial design studies, pilot or treatability studies, and remedy implementation.

This decision is issued concurrent with the Portland Harbor Superfund Site ROD. The Portland Harbor ROD, particularly in Section 14, explains where and how the remedy will be implemented by identifying post-ROD data gathering and monitoring activities, and describing factors that will be relevant to remedy implementation. I anticipate that the parties who perform post-ROD cleanup work will be involved in the development of post-ROD data gathering plans, monitoring plans and remedy implementation strategy.

The ROD identifies three phases of monitoring – baseline and remedial design data collection, construction monitoring, and long-term monitoring. The baseline and remedial design data collection discussion is most relevant to remedy implementation. This data collection effort will include, for example, the collection of surface sediment, sub-surface sediment, river bank, surface water, sediment pore water, groundwater, and fish tissue samples. In addition, and during the same period, data will be collected to refine the understanding of the Site bathymetry, inform flood-rise monitoring, identify NAPL, and update EPA's understanding of reasonably anticipated future uses within and along the waterway and ensure that implemented remedies are consistent with these uses. This new information will inform the implementation of the Selected Remedy decision tree and may result in implementation of different remedial technologies in different footprints than those mapped in the Final FS.
For example, dredging and capping will be implemented in areas where the new information identifies exceedances of the RALs, and these areas may differ from those that were assumed to be dredged or capped in the Final FS.

The ROD recognizes that the Selected Remedy may need to be implemented in phases and/or work sequenced and identifies factors the EPA will consider to implement the remedy. These factors include, at a minimum, source control actions, recontamination potential, scope (size) of actions across the Site, impacts to river users and the community, seasonal weather impacts, fish windows, and the implementation approach proposed by parties who agree to implement the Selected Remedy. While no such decisions have been made, the Site may be divided into work areas for purposes of design and construction activities based on factors such as prioritization of significant source areas, logistics, efficiency, or other factors; and sequencing of cleanup work may consider factors such as potential impacts of upstream work on downstream areas, including but not limited to, the potential for resuspension of contaminants during construction, nature and extent of contamination, and integration of the cleanup actions into the overall Site remedy.

The ROD makes clear that the manner in which the Selected Remedy is implemented will be refined as additional information is developed during remedial design, is likely to differ from the assumptions used in the Final FS, and suggests that the implementation strategy will be flexible and practically based on the relevant information developed post-ROD.

In conclusion, for the above reasons, I deny all relief requested in the June 22, 2016 letters of dispute. In so doing, I specifically determine that the Final FS is compliant with CERCLA and the NCP, and provides an appropriate basis for selecting a remedy in a ROD for the Portland Harbor Site.

Sincerely,

Sheryl Bilbrey

Sheryl Bilbrey, Director
Office of Environmental Cleanup

Enclosure
Appendix A: EPA's Response to Dispute Issues

Appendix A
EPA Responses to Dispute Issues
12/27/16

I. INTRODUCTION

On September 28, 2001, ten parties entered into an Administrative Settlement and Order on Consent to perform the remedial investigation and feasibility study for the Portland Harbor Superfund Site (hereinafter referred to as the "RI/FS AOC"). [**AR Doc # 711519]** The Respondents to the RI/FS AOC call themselves the Lower Willamette Group ("LWG"). Section XVIII. of the RI/FS AOC provides a dispute resolution process for any disputes concerning "activities or deliverables required under the order." On February 4, 2016, EPA and the LWG mutually agreed that it would be more effective and efficient if EPA finalized the Feasibility Study. [**AR Doc # 100003435]** EPA and the LWG also agreed that the LWG could dispute the final FS within 14 days of publication of the final FS along with the Proposed Plan. Specifically, the February 4 letter [Page 2] agreement stated:

> The EPA will allow the LWG AOC signatories to dispute the final FS that the EPA produces and publishes along with the Proposed Plan. In making this agreement, if any LWG AOC signatories decide to dispute the final FS under Section XVIII of the AOC, the LWG signatories must submit their Dispute Statement within 14 days of the publication of the Proposed Plan. The Dispute Process under the AOC would be streamlined by proceeding directly to the formal determination phase wherein the Director's decision is anticipated to be made simultaneously with the agency's remedy decision after considering all public comments along with the disputed issues. In accepting this agreement, the LWG agrees that, because the dispute process will be conducted during the public comment period, the LWG's Dispute Statement will be placed in the administrative record and the dispute process will be conducted consistent with requirements for public participation for the proposed remedy decisions under CERCLA the NCP, and federal law.

Section XII., Paragraph 1 of the AOC [Page 22] provides that EPA retains responsibility for preparation and release of the Proposed Plan and Record of Decision. The FS is a separate and distinct document from the Proposed Plan. Likewise, under the terms of the AOC, the Proposed Plan was not an "activity or deliverable" that the LWG was required to produce. Therefore, the scope of this dispute is limited to issues concerning the June 2016 FS **[AR Doc # 840000 through 840019]**, not the Proposed Plan. Additionally, consistent with the agreements reached in the February 4 letter, EPA's disapproval of the LWG's 2012 FS also is not within the scope of this dispute.

Moreover, throughout the LWG's dispute statement, they ask for an explanation or rationale for why EPA's final FS was changed from an earlier draft FS, hereinafter the August 2015 FS. As stated above, the subject of the dispute process is only EPA's final FS, so the responses below focus on the particular issues raised with the final FS and we do not explain every change made from earlier drafts unless needed to fully respond to a specific final FS issue.

EPA published the Proposed Plan and FS, along with the administrative record, on June 8, 2016. On June 22, 2016, seven out of the ten AOC signatories submitted three separate

Dispute Statements.[1] **[AR Doc # 100031247, 100031251, 100031255, 100031259, 100031265, 100031266, 100031275, 100031277, 100031278]** The collective group of seven submitted a Dispute Statement, in which Arkema, Evraz, Gunderson, NW Natural, TOC Holdings, Inc. and Union Pacific attached additional issues in an Appendix to their dispute statement. LSS, Inc. (agent for Arkema, Inc.) and Union Pacific submitted separate Dispute Statements as well. Below are EPA's responses to all three Dispute Statements. We have organized the responses by each Dispute Statement, i.e., LWG Response, Arkema Response and Union Pacific Railroad Response. However, if an issue was already raised and discussed, EPA provides a reference to where the discussion is provided.

The LWG, including each individual Respondent to the RI/FS AOC, has had significant input and opportunities to comment on EPA's FS for the Portland Harbor Site. EPA began discussing its ideas and proposals for modifications to the LWG's 2012 draft FS since at least December 2012 when EPA notified the LWG that it could not approve the LWG's 2012 draft FS. **[AR Doc # 100007299]** EPA shared and discussed its draft modifications on FS Section 1 starting on July 8, 2014, and made changes based on the LWG's requested modifications and issues to that Section. **[AR Doc # 100009736, 100010079, 100010083, 100010101, 100010298, 100010490, 100010848, 100010854, 100010876, 100011126, 500003669, 100015709]** Likewise EPA provided and discussed modifications to Section 2 on February 23, 2015 and made changes to that chapter as a result of the LWG's requested modifications and issues to that Section. **[AR Doc # 100013186, 100015799, 100015924, 100015925, 100013288, 100017731, 100015709]** Sections 3 and 4 of the draft modified FS were shared on July 29 and August 18 2015, respectively, and the LWG had the opportunity and provided significant comments on those last two sections to Region 10. **[AR Doc # 100017731, 100003852, 100016145, 100015709, 100003806]** The LWG also had the opportunity to provide recommendations for the proposed remedy to the National Remedy Review Board and Contaminated Sediment Technical Advisory Group in which they also provided their comments on the draft modified FS. **[AR Doc # 1412910]** Over all of this time, EPA and LWG had meetings at both the technical staff level and senior management levels regarding the direction EPA was going in its modifications to the FS. Every step of the way, EPA considered the LWG's comments in producing the 2016 FS. EPA has been transparent and open with the direction and scope of the modifications that it determined was needed to the LWG's 2012 draft FS. The LWG has had significant opportunities to raise comments and issues. In addition to this dispute opportunity, the LWG collectively or as individual commenters had the opportunity and have taken advantage of their rights to submit public comments on the Proposed Plan and administrative record through the public participation process and comment period on the Proposed Plan.

After considering all of the Dispute Statements and responses, the fundamental conclusion is that EPA's 2016 FS contained appropriate remedial alternatives that were

[1] The seven LWG members are: Arkema, Inc., Chevron, U.S.A. Inc., Evraz, Inc. N.A., Gunderson LLC, NW Natural, TOC Holdings Co. and Union Pacific Railroad Company.

evaluated consistent with the NCP and EPA guidance. The development and evaluation of the alternatives adequately reflected the scope and complexity of the remedial action and site problems being addressed. Some minor textual or technical errors or omissions were found while responding to some of the dispute issues or other public comments many of which have been corrected in response to comments; however, none of the errors or omissions were fundamental nor undermine the basis for the final remedy decision documented in the Record of Decision. The 2016 FS as supplemented by this Responsiveness Summary and all of the corrections, clarifications, and supplemental analysis contained herein along with remainder of the administrative record support the selected remedy documented in the Record of Decision.

II. LWG DISPUTE STATEMENT RESPONSE

The LWG's dispute statement objected to EPA's modifications to the LWG 2012 draft FS and stated three bases for their objections to the 2016 FS, which are summarized below:

1. EPA's conclusions that alternatives B and D are not protective or fail to comply with ARARs is based upon methods that are inconsistent with the remedial investigation and baseline risk assessments. EPA's failure in the June 2016 FS to evaluate protectiveness in a manner consistent with the approved risk assessments and with sound risk management principles results in large areas being designated for active cleanup where risks are either not present or cannot be meaningfully reduced through a sediment cleanup.
2. EPA's June 2016 FS lacks a complete and transparent evaluation of the long- and short-term effectiveness and cost-effectiveness of its alternatives, as well as the degree to which those alternatives reduce the toxicity, mobility or volume of hazardous substances, including PTW, through treatment. EPA's 2016 FS also: (1) has inadequate cost estimates; and (2) does not have an evaluation of how long it will take each alternative to achieve cleanup levels. Therefore, a proper analysis of alternatives would not result in selection of Alternative I.
3. EPA's FS fails to articulate a framework and schedule for implementation by which each alternative can be compared. EPA's 2016 FS should describe what adjustments to the selected cleanup are possible or how adjustments would be determined. EPA should identify in its alternatives development and decision trees what refinements can be made through remedial design and implementation.

The LWG raised numerous issues in support of one or more of their objections; some of which were very general and others more specific. Responses to their issues are provided below, and demonstrate that EPA's 2016 FS appropriately evaluated protectiveness in a manner consistent with the NCP, including appropriately applying the conclusions from both the Baseline Human Health Risk Assessment ("BHHRA") **[AR Doc # 713364]** and Baseline Ecological Risk Assessment ("BERA") **[AR Doc # 1432515 and 1432516]**, where appropriate. Likewise, EPA's 2016 FS complies with the NCP and is transparent about the long and short-term effectiveness of each alternative as well as how all of the

other seven NCP criteria were evaluated. Lastly, neither the NCP nor EPA guidance requires a FS to provide a framework and schedule for implementing each alternative, nor to describe what adjustments are possible in implementation. EPA's 2016 FS did, however, identify throughout the report various information, data and analysis that would be needed for remedial design.

The following provides each issue in italic text as discussed in detail in the dispute document, including footnotes and references when they added further technical support for dispute issue, and follows with EPA's position on each of the disputed issues in regular text. Since these three issues raised by LWG had many parts, EPA has provided numbering to allow reference between issues raised by the LWG and by individual LWG parties that have submitted dispute statements.

LWG Dispute Issue 1

EPA's conclusions that certain alternatives are not protective or fail to comply with ARARs are based upon evaluations that are inconsistent with the approved remedial investigation and baseline risk assessments and fail to apply appropriate risk management principles.

LWG Dispute Issue 1a:

EPA has not explained why Alternatives B and D are not protective of the environment. EPA believes that all alternatives (except the "no action" alternative) are protective of human health. However, contrary to its August 2015 FS, EPA has now identified Alternatives B and D as not or possibly not protective of the environment.[9] As best we can tell, EPA has changed its conclusion about Alternatives B and D based largely on its revised approach to benthic risk.[10]

9 In part, EPA bases its determination that Alternative B and D may not be protective of ecological risk on the fact that institutional controls do not effectively prevent exposure by ecological receptors. However, all alternatives rely to some extent on institutional controls, and this was also the case with all alternatives in the August 2015 FS.
10 The LWG has previously commented that EPA should use the Comprehensive Benthic Risk Areas (CBRA) approach previously developed based upon the approved BERA to evaluate benthic risks consistent, and the NRRB commented that EPA should revisit the benthic approach for the final FS. National Remedy Review Board and Contaminated Sediments Technical Advisory Group Recommendations for the Portland Harbor Superfund Site (EPA, December 31, 2015), p. 4.

EPA Position:

The evaluation of overall protection of human health and the environment for Alternatives B and D is discussed in Sections 4.2.2.1 and 4.2.3.1 of the 2016 FS. EPA concluded that these alternatives were protective of human health because institutional controls can be set in place to ensure protection until such time as cleanup levels are achieved. Since institutional controls cannot be placed to ensure protection of the environment, EPA concluded that these alternatives were unlikely to be protective of the

environment. The determination was not made solely based on benthic risk as purported by the Respondents but rather on a more broad-based evaluation consistent with EPA guidance as discussed in more detail below. As stated in Sections 4.2.2.1 and 4.2.3.1 of the 2016 FS, the determination of protectiveness is drawn from the evaluation of all the RAOs and the uncertainty analysis presented in Appendix I. Protection of the environment draws from RAOs 5, 6, 7, 8 and 9: RAO 6 had post-construction HQ of 34 for BEHP.

Based on recommendations from the NRRB/CSTAG (see NRRB/CSTAG comment on Remedy Performance, p. 5), EPA performed an uncertainty analysis of each alternative to determine the likelihood that the Alternative would significantly different from the No Action alternative. This analysis was presented in Appendix I of the 2016 FS, and the conclusion was that Alternative B post-construction SWACs were statistically indistinguishable from the No Action alternative and that the post-construction SWACs for Alternative D were still within the margin of error relative to no action. Since the No Action alternative was deemed to not be protective, EPA reasons that Alternatives B and D are also not protective since Alternative B was statistically indistinguishable from the No Action alternative, and Alternative D was only slightly better for PAHs and PCBs (the SWAC from the DDx RAL for Alternative D were also statistically indistinguishable from the No Action alternative).

As stated in EPA's RI/FS Guidance (USEPA 1988), "The overall assessment of protection draws on the assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs." EPA's assessment was that an insufficient amount of active remedy was conducted under these alternatives to ensure that the environment would be protected in a reasonable time frame, if at all (see discussion of long-term and short-term effectiveness in Sections 4.2.2.3, 4.2.2.5, 4.2.3.3, and 4.2.3.5 of the 2016 FS).

With regard to footnote 10, the Comprehensive Benthic Risk Approach (CBRA) developed by the LWG on their own initiative provided in the LWG's 2012 FS (Appendix P); it was not done as part of or consistent with the BERA as stated by the Respondents. EPA disapproved the LWG's 2012 FS, including the CBRA, in a letter dated December 18, 2012. **[AR Doc # 100007297, 100007298, 100007299]** Comment 1 attached to EPA’s disapproval notice noted that the benthic risk evaluation provided in the LWG's 2012 FS would need outstanding issues to be resolved. EPA had started working with the LWG to resolve outstanding issues, but found that the approach was inconsistent with CERCLA, the NCP, and EPA policy and guidance in that it was based on bioassays and models which were not linked to hazardous substances released at the Site. The NRRB/CSTAG recommended that EPA’s PRGs for benthic risk be consistent with the benthic SQVs in the BERA (See NRRB/CSTAG comments on Human Health and Ecological Risk, **AR Doc # 100001536**), but were silent on the approach to use to evaluate benthic risk as purported by Respondents.

LWG Dispute Issue 1b:

EPA made extensive changes to the benthic approach for this FS, but those changes are still inconsistent with the comprehensive benthic risk approach contained in the approved Baseline Ecological Risk Assessment (BERA). The FS states: "The protection of benthic species to [sic] contaminated sediment is evaluated using the benthic risk area defined by an order of magnitude greater than the RAO 5 PRGs. The post-construction interim target for RAO 5 was established at 50 percent reduction in the area posing unacceptable benthic risk." So, instead of using the Comprehensive Benthic Risk Area (CBRA) approach previously developed collaboratively with EPA and the LWG using multiple lines of evidence, EPA now maps benthic PRG exceedance factors on a point-by-point basis and uses a 10 times exceedance factor to identify areas of concern. EPA then concludes that if 50% of this area is actively remediated, the alternative is "protective" on an interim basis. It is completely unclear how this new method is: 1) in any way more accurate or consistent with the BERA; and 2) more predictive of benthic risk or the effectiveness of the alternatives, as compared to simply using the previously developed CBRA, which are entirely consistent with the BERA.[12]

12 Further, benthic risk models do not honor the measured data. Although the LRM and FPM are model predictions using data from the toxicity tests conducted with site sediments, some of measured data is not honored. Any modeled risk for benthic invertebrates that ignores actual toxicity testing results needs to be assessed in weight-of evidence and river-mile specific decision-making. The benthic risk footprints should not extend into areas shown to have a lack of toxicity based on actual laboratory toxicity tests. Though EPA states measured toxicity data were reviewed to evaluate correlation with model predictions (EPA June 2016 FS Appendix D, p D-31), the resulting areas are not consistent with the BERA.

EPA Position:

See EPA's position to LWG's dispute issue 1a regarding the CBRA. The LWG's dispute statement does not provide a clear or specific basis for why the CBRA should be used instead of the BERA and the 2016 FS alternatives evaluation approach. The rationale for the approach used in the 2016 FS is explained below.

In the BERA, impairments in survival and growth (expressed as biomass) were directly measured at nearly 300 locations in site-specific sediment toxicity tests with two benthic invertebrate species, approximately 20 percent of the total number of sediment samples collected for chemical analysis. The co-occurring sediment contaminant concentrations in sediments where toxicity was observed were used in the development of two site-specific predictive models of sediment toxicity, the floating percentile model and the logistic regression model. Contaminant concentrations predicted to be toxic from these two models, as well as the empirical data, were used to evaluate benthic risk on a point-by-point basis in the final BERA. The two models are also the source of many of the RAO 5 sediment PRGs for ecological risk. The PRGs for RAO 5 were the SQVs derived in the BERA and are thus consistent with the conclusion of the BERA.

The comprehensive benthic risk area developed by EPA is shown in Figure 4.1-1 of the 2016 FS and is the cumulative footprint of all RAO 5 PRGs. Mapping of benthic risk areas based on a point-by-point PRG exceedance is justified due to the limited mobility of many of the benthic species. This means that some benthic species are exposed to contaminant concentrations posing unacceptable ecological risks (defined as the RAO 5 PRGs) for their entire lifetime. Additionally, benthic species are likely exposed to sediment contaminant concentrations for a sufficiently long exposure duration that results in contaminant bioaccumulation to concentrations (the RAO 6 PRGs) posing risks to aquatic-dependent wildlife species that prey on benthic species.

Under EPA's Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments – Interim Final (June 1997) adverse effects on populations can be inferred from measures related to impaired survival, reproduction and/or growth. A subsequent EPA Policy memorandum (Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites, OSWER Directive 9285.7-28 P, October 7, 1999) states that ecological risk assessments are intended to protect local populations and communities of biota. Contaminant concentrations that are expected to protect local populations and communities can be estimated by extrapolating from effects on individuals and groups of individuals using a lines-of-evidence approach. This approach was extensively used to evaluate ecological risks at Portland Harbor. However, the conclusions of the BERA provide for which contaminants are posing unacceptable risk based on those lines-of-evidence (site-specific toxicity tests, bioaccumulation models, and species diversity studies; BERA Table 3-1). These are all based on empirical site data and these lines-of-evidence cannot be used to determine effects to the benthic population through means other than empirical testing post construction.

In the 2016 FS, PRGs are developed for those hazardous substances that are posing unacceptable risk at the Site. EPA adopted the site-specific SQVs from the BERA for RAO 5 consistent with the recommendations of the NRRB/CSTAG. These footprint of each PRG was evaluated against the L2/L3 exceedances from the bioassays and both predictive models to determine if the benthic risk coincided with the release of these contaminants. The maps presenting that information is presented in the 2016 FS, Appendix D11. EPA used best professional judgement to not address all benthic risk through dredging and capping and allow for some benthic risk to be addressed through MNR. However, in conducting the evaluation of alternatives, it is necessary to discuss the overall protectiveness. Since a model is not available to determine if these PRGs will be achieved in a reasonable time frame, EPA used best professional judgement to evaluate overall protectiveness for RAO 5 in the 2016 FS (Section 4.1-3, p.4-8) as:

The protection of benthic species to contaminated sediment is evaluated using the benthic risk area defined by an order of magnitude greater than the RAO 5 PRGs. The post-construction interim target for RAO 5 was established at 50 percent reduction in the area posing unacceptable benthic risk. This is acceptable because protection of the benthic community is based on a population rather than individual effects, and is considered a

target to which the benthic population as a whole can be stressed and still recover, in conjunction with the uncertainty associated with the predictive models used to develop these PRGs.

Thus, the 2016 FS used the same metric as all other RAOs in establishing an interim goal that was an order of magnitude greater than the PRGs. EPA's rational in the 2016 FS that this was reasonable since there is uncertainty based on the conservativeness of the SQVs used in the models (see BERA Section 6.2.5). Since benthic risk is made on a population basis, EPA's best professional judgement was that the entire affected community of benthos did not need to be addressed through capping and dredging and made an assumption that if 50 percent was addressed through active remediation of the highest contaminant concentrations, the other 50 percent would be addressed through MNR for the lower contaminant concentrations. Since benthic effects from contaminated sediment are due to survival, reproduction and growth (not just survival), this approach would also ensure that the entire population was not diminished through active remediation (capping and dredging will affect the survival – or kill - benthic organisms where it occurs) and some of the population affected through reproduction and growth could recover more slowly through MNR.

LWG Dispute Issue 1c:

EPA's conclusion that Alternatives B and D are not protective of the environment may also relate, at least in part, to EPA's decision to evaluate the performance of its alternatives based upon recalculated surface weighted average concentrations (SWACs) rather than those used in its August 2015 FS (used by EPA to estimate post-construction risks, detailed in EPA's Appendix J). The selection of a preferred alternative at a sediment CERCLA site is very sensitive to and dependent (i.e. "sensitively dependent") on the SWAC value of site; however, nothing in the June 2016 FS explains why EPA has changed its methodology for calculating SWACs between the August 2015 FS and the June 2016 FS, why EPA believes its current methodologies are superior to its prior methodologies, or even precisely what its current methodologies are.

The June 2016 FS appears to use these new SWACs to estimate pre- and post-construction risks for the alternatives. EPA presents an uncertainty analysis in Appendix I that evaluates different methods for estimating SWACs for pre-construction sediment surfaces. Using PCBs as an example, EPA presents SWAC estimates using four different methodologies that range between 79 and 205 micrograms per kilogram (µg/kg). (The natural neighbor method used for Remedial Action Level (RAL) curves in Section 3 estimates a site-wide SWAC of 92 µg/kg, which does not match any of the values in Appendix I). It is not clearly explained in the main text, but based on tables presented in Appendix J (see Table J2.3-1a), it appears that EPA uses a high-end site-wide SWAC estimate (208 µg/kg, which is close to 205 µg/kg but not the same) to represent current site conditions for RAO 2 (i.e., pre-construction risks; identified as post-construction risks for Alternative A). This results in EPA presenting pre-construction risks that are completely inconsistent with risks identified in the approved BLRAs[13]. The risks estimated for Alternative A (no action) should be the same as baseline risks. EPA also assumes that

postconstructed surfaces are "zero" (see ES-14). The net effect of these assumptions is that EPA poses technically unrealistic risk reduction estimates for all the alternatives. At the same time, EPA has not explained its use of the highest available estimate for pre-remediation SWACs and associated risks, which estimates are inconsistent with the BLRAs.

13 The site-wide fish consumption risks estimated in the BHHRA (summarized in Section 1.2.5.1) are higher than those presented for Alternative A in Table J2.3-1a. However, the risks for Alternative A appear to be based on some estimate of an arithmetic mean concentrations whereas the BHHRA risks are based on 95% UCL or maximum concentrations. The average PCB concentration in the BHHRA based on actual tissue data was 160 ug/kg in bass and 2,500 ug/kg in carp, which includes a single outlier sample of 19,000 ug/kg (the average without the outlier is 353 ug/kg). The modeled tissue concentrations used for Alternative A are 352 ug/kg for bass and 820 ug/kg for carp, which are approximately 2 times higher than the measured tissue concentrations (excluding the single carp outlier). The river mile risks for Alternative A cannot be compared directly with the BHHRA because the risks for Alternative A are calculated based on one-third transects of a rolling river mile (both sides of the river and navigation channel) whereas the BHHRA risks were for an entire (bank-to-bank river mile). However, the risks for Alternative A are generally higher than those in the BHHRA (potentially due to spatial scale issues). In the BHHRA, risks at RM 11 were 1 x 10-3 and all other risks were less than 1 x 10-3. For Alternative A, EPA's FS indicates there are several segments with risks of 1 x 10-3 or higher.

EPA Position:

The 2015 draft FS and the 2016 FS both calculated SWACs on an SDU scale in the same manner. The 2015 draft FS did not calculate Site-wide SWACs; this was added to the 2016 FS in order to evaluate protectiveness to the RME based on Site-wide exposure consistent with the BHHRA. The Site-wide SWAC was developed consistent with the exposure of smaller range fish species rather than the methodology used by the LWG in their 2012 draft FS. Thus, EPA did not replace the evaluation, but supplemented it with additional analysis.

EPA evaluated the uncertainty associated with the calculated post-construction SWAC for each alternative as requested in the NRRB/CSTAG comments. The rationale for calculating Site-wide SWACs using alternative methodologies to reduce the bias introduced utilizing a non-random sample is explained in Appendix I of the 2016 FS. EPA is unclear to what Respondents' definition of "the SWAC value of site" is referring, as a SWAC is merely a spatially weighted concentration. As presented in Section 4.1.1 of the 2016 FS, the comparative analysis of the various alternatives is evaluated on several relevant spatial scales, including Site-wide and on a river mile, or SDU scale.

The 2016 FS, Appendix I, Section I.4, recommends that "with biased sampling prevalent at Portland Harbor it is necessary to spatially weight the data in order reduce bias in the estimated mean and to properly characterize uncertainty bounds." Therefore, as described

in Section J2.1 of the 2016 FS, SWACs were calculated for each of the 27 geographic areas based on the recommendations in Appendix I and the 95 percent upper confidence limit on the mean was calculated for each RAO 2 COC. These UCLs were used as inputs to the FWM to calculate Site-wide average tissue concentration consistent with the final BHHRA. [Appendix I has been updated to include Figure I-9 depicting the 27 geographic areas where the SWACs were calculated for this analysis.] The pre- and post-construction concentrations were then used as the input into the food web model to estimate exposure concentrations to calculate pre-and post-construction risks, consistent with the process used in the BHHRA (the BHHRA calculated the 95 percent upper confidence limit on the mean of concentrations in fish tissue). Use of the food web model to estimate post-construction tissue concentrations is consistent with the process the LWG used in its 2012 draft FS. It is also appropriate to use for estimating risks for the no-action alternative, as the same metric is then used for the comparative analysis. Using the LWG-calculated "site-wide" SWAC of 92 µg/kg for PCBs results in an estimated average tissue concentration of 232 µg/kg, which equates to an estimated risk of 5×10^{-4} from PCBs alone, which is not consistent with and much lower than the 1×10^{-2} risk estimate for PCBs presented in Table 5-74 of the BHHRA. Since the efficacy of each alternative can only be evaluated through the use of predictive tools, and since the results of the BHHRA can't be replicated through use of the LWG-developed tools, comparing the baseline risks presented in the BHHRA to those estimated by the models would show an unrealistic decrease between the no action alternative and Alternative B.

Due to the lack of a defensible sediment transport model for the lower Willamette River, it was not possible to predict COC concentrations in remediated areas beyond t=0 with any degree of confidence. Assuming a clean residual or cap layer is sufficient for FS purposes and allows for use of a consistent metric of potential risk reduction in the comparative analysis of alternatives.

All risk-based PRGs presented in the 2016 FS utilize the exposure assumptions presented in the EPA-approved baseline risk assessments that are a part of the final RI report. Nonetheless, EPA is perplexed by the LWG's current concern that the 2016 FS might be "inconsistent with the approved baseline risk assessments," given that in their 2012 draft FS they abandoned the exposure assumptions from the risk assessments when developing remedial goals, and at that time they were totally comfortable using alternate assumptions. As stated in the 2012 FS (Appendix E, Section 1.1):

"…alternate scientifically valid assumptions from those required by EPA could have been used in the BHHRA and in the development of remediation goals (RGs) for protection of human health."

<u>LWG Dispute Issue 1d:</u>
EPA's June 2016 FS improperly aggregates sediment data from 1997 through 2011 for the surface sediment characterization and is therefore significantly inaccurate. If EPA assumes a higher preremediation SWAC value that is inconsistent with the risk assessments and based on outdated data, then more aggressive clean up alternatives may

plot closer to the inflection (i.e. "knee") of the utility curve. That inappropriate portrayal could lead a decision maker to select a remedy that requires more active remediation than is required to achieve cleanup goals. EPA's use of a SWAC that is inconsistent with the risk assessments exaggerates the benefits of the larger alternatives and artificially drives remedy selection toward larger alternatives (e.g. E, F and I). If the SWAC value is set consistent with the approved risk assessments, the utility curve actually supports remedy selection toward Alternatives B, C and D.

EPA's Position:

The EPA 2016 FS uses the same "aggregated data" that the LWG used in their 2012 draft FS, except that data from the NW Natural and LSS early actions were also included. The LWG's 2012 draft FS, Appendix Ha (pp 26-27) states: "Because somewhat limited data were collected at the beginning of the model simulation period, and because the sediment data from that time did not fully characterize sediment levels uniformly throughout the site, the entire FS sediment dataset, which includes sediment data collected between 1997 and 2010 has been deemed representative of current conditions in the site." Further, p.46 of the LWG's 2012 draft FS, Appendix Ha states that "assessment of temporal changes in these data is difficult because this was not and objective of the historical sediment sampling programs … and as such, sediment data were generally examined qualitatively during model calibration." Consequently, if aggregating the data was significantly inaccurate or fatally flawed, so was the LWG's 2012 FS, which they claim incorporated "good science" and "provides an adequate basis for selecting a remedy." Further, the data collected for the Site was the same data used in the baseline risk assessment and therefore is appropriate to use to determine the expected risk reduction from implementation of each of the alternatives developed in the 2016 FS.

The baseline risk assessments use actual fish tissue data, not sediment SWACs, to determine risk. SWACs are a tool developed for the 2016 FS to compare alternatives to the No Action alternative and are not used nor discussed anywhere in the BERA or BHHRA. In the BHHRA, direct contact exposures to sediment were evaluated by aggregating data by exposure areas and calculating the 95 percent UCL on the mean; sediment data was not used to assess the fish consumption pathway. In the BERA, sediment data was also used to calculate a UCL on the mean of data within various spatial scales of receptors, rather than SWACs. The spatial scales used in the EPA's 2016 FS are consistent with those used in the risk assessments and the exposure assumptions are the same.

The RAL curves used to develop the remedial alternatives are not risk-based, although it is presumed that reductions in sediment concentrations will subsequently reduce risk since the exposure to contamination would be reduced by reducing the SWAC. The EPA RALs for PCBs, PAHs, and PeCDF are the same as the LWG's RALs for these contaminants in their 2012 FS and the curves are nearly identical (see Figures 3.4-1, 3.4-2, and 3.4-5, Tables 3.4-1, 3.4-2, and 3.4-3, and Appendix D5 of 2016 FS and Figures 4.3-1, Figure in Appendix Db p.89 of pdf, and Table 4.4-1 of the LWG's 2012 draft FS). The placement of the RALs on the curve are irrelevant to the selection of a remedy. How

the alternatives perform based on the nine criteria specified in the NCP are the basis of remedy selection.

The FS fails to explain how the alternatives it has developed contribute to meaningful risk reduction in specific areas of the site. Protectiveness is a threshold criterion under CERCLA, but "protectiveness" does not support an EPA requirement for remedial action in the absence of identified unacceptable risk or failure to comply with an ARAR.14 The LWG has previously commented that EPA's August 2015 FS failed to follow the BLRAs or provide a clear description of risk management decisions, resulting in an FS that was inconsistent with the BLRAs in many respects. Many of those comments remain relevant to the June 2016 FS and, in general, we will not repeat them here.15 However, several aspects of the June 2016 FS contain new or revised evaluations from the August 2015 draft that not only diverge without explanation from the approved risk assessments but lack any demonstration of their superiority to the analyses of the same and similar issues in EPA's August 2015 FS.16

EPA Position:
The phrase "meaningful risk reduction" in the LWG's dispute is a subjective term and is nowhere defined in CERCLA, the NCP, EPA guidance or policy, nor by the LWG themselves. A discussion of risk reduction is provided in both the overall protection to human health and the environment and the long-term effectiveness discussions of each alternative in the 2016 FS. The discussion of long-term effectiveness discusses post construction risk for each alternative and compares it to the residual risk posed by the PRGs. The interim goals established in Section 4.1.3 of the 2016 FS were based on uncertainty in the PRGs and is used as a point at which EPA believes is acceptable risk for MNR to achieve PRGs in a reasonable time frame.

The 2016 FS is based on the baseline risk assessments and is consistent with the conclusions of those risk assessments. The 2016 FS is also consistent with the NCP and EPA guidance regarding development of PRGs for the Site.

Issue 17: 17. Risk Inconsistency – EPA's methods and results are often inconsistent with the BLRAs throughout the FS including Sections 2, 3, 4. This culminates in Section 4 with a residual risk assessment that departs significantly from the methods and findings of the BLRAs. The LWG has commented to EPA on numerous occasions (e.g., LWG 2014d, 2015a, 2015b) that EPA should include risk management steps in the FS consistent with guidance. These comments include that EPA should address only those potential risks for contaminants, media, and pathways that were clearly found to pose unacceptable risks in the BLRAs and that EPA should further focus on the subset of unacceptable risks that are required for selecting an effective and protective remedy using all of the FS criteria. Instead, EPA has departed from the BLRAs and applied virtually none of the risk management steps noted in guidance such as the 2005 sediment remediation guidance and EPA's 11 Risk Management Principles Memorandum for, "making scientifically sound and nationally consistent risk management decisions at contaminated sediment sites." The relevance of this guidance to risk management steps in the FS is reviewed in

detail in Sections 10.1 and 10.2 of the 2012 draft FS. In summary, EPA guidance (2005a) discusses "Risk Management Principles and Remedial Approaches" and clearly describes that the cleanup should use a "risk-based framework"; "select site-specific, project-specific, and sediment specific risk management approaches that will achieve risk-based goals"; and "ensure that sediment cleanup levels are clearly tied to risk management goals" (p. 1 – 5).
Specific issues related to EPA's lack of consistency with the BLRAs, residual risk assessments, and lack of risk management include:
a. Per the LWG's 2014 Section 2 comments (LWG 2014d) and consistent with law, EPA guidance, and precedents from other sediment sites as detailed in past comments:
i. RAOs, COCs, and PRGs should only be designated for contaminant exposure scenario pairs (ecological or human health receptors and pathways) for which the EPA-approved BLRAs identified potentially unacceptable risk from in-river media (e.g., not potential upland source media, and ARARs should not be used to develop PRGs for non-COCs).
ii. PRGs should be established and applied for these COCs consistent with risk assessment methods (e.g., spatial scales) and only where sufficient technically valid information exists to do so.
iii. The FS should focus on those COCs and PRGs that are technically practicable to achieve and for which acceptable risk levels can be reached through the sediment remedial action alternatives being evaluated in the FS.
iv. COCs and PRGs should only be established if reasonably conservative risk management approaches indicate that a contaminant is significantly contributing to risk and that evaluation of remedial alternatives with respect to a PRG for a particular COC/exposure pathway pairing is required in order to select a protective remedy.

EPA Position:
The Portland Harbor Site, as listed on the National Priorities List (NPL), includes an in-river and an upland portion. The 2016 FS focusses on the in-river portion of the Site and establishes RAOs that are protective for that portion of the Site. This includes protection of media such as surface water, pore water, and biota, in addition to sediments. It is clear that EPA may take a response action not only where there is a release, but where there is the potential threat of a release. 42 USC Section 9604(a). Further, the NCP and EPA guidance clearly state that other factors, such as ARARs, MCLGs and MCLs, and water quality criteria are to be used in developing PRGs and that risk-based levels are to be used where these PRGs are not available or risk cumulatively exceed 10^{-4}. Thus, exceedance of a water quality criterion or an MCLG/MCL can be a basis for action in addition to the findings of a risk assessment.

CERCLA 104(a)(1) states "Whenever (A) any hazardous substance is released or there is a substantial threat of such a release into the environment, or (B) there is a re1ease or substantial threat of release into the environment of any pollutant or contaminant which may present an imminent and substantial danger to the public health or welfare, the President is authorized to act, consistent with the national contingency plan, to remove or arrange for the removal of, and provide for remedial action relating to such hazardous substance, pollutant, or contaminant at any time (including its removal from any

contaminated natural resource), or take any other response measure consistent with the national contingency plan which the President deems necessary to protect the public health or welfare or the environment."

42 USC Section 9604(a)(1). The NCP [40 CFR Section 300.430(e)(2)] states that RAOs shall be developed considering (A) ARARs using factors of acceptable risk for systemic toxicants, cancer risks when ARARs not available, detection/quantitation limits, uncertainty, or other pertinent factors, (B) non-zero MCLGs, (C) MCLs, (D) when cumulative risk from ARARs is greater than 10^{-4}, use factors in (A), (E) water quality criteria, (F) ACLs, (G) levels protective of ESA T&E species.

EPA policy *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions* (OSWER Directive 9355.0-30, USEPA 1991) states that "For sites where the cumulative site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10 (-4), action generally is not warranted, but **may be warranted if a chemical specific standard that defines acceptable risk is violated** or unless there are noncarcinogenic effects or an adverse environmental impact that warrants action."

EPA's 1991 policy also states that "Where the **cumulative carcinogenic site risk** to an individual based on **reasonable maximum exposure** for both current and future land use is less than 10 (-4) and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts." (emphasis added) Both the BHHRA and BERA conclude that there is unacceptable risk at the Site that warrant EPA action (cumulative risk greater than 10-4 and HI or HQ greater than 1); thus, action is warranted at this Site.

Neither CERCLA, the NCP, nor EPA policy or guidance states that action may only be taken where risks are identified in the risk assessments. The NCP is clear that action may also be taken based on an exceedance of an MCLG/MCL or water quality criterion. Further, the risk assessments did not evaluate specific exposures in every area of the Site due to lack of data. The upland sources are not separate and distinct from the contamination in the river. The 2016 FS covers the in-river portion of the Site and thus the RAOs and PRGs must be developed to protect the media and pathways for which contamination is present. Since the RAOs and PRGs developed for this Site are based on the baseline risk assessments and ARARs, those areas of the Site which already achieve PRGs would not require action since the PRGs are already attained. EPA provides the basis for the establishment of PRGs for each RAO in Section 2 and Appendix B of the 2016 FS.

v. Consistent with EPA background guidance (EPA 2002), PRGs should not be set below reasonably achievable anthropogenic background levels (this includes the concept of "equilibrium" as explained in LWG 2014g). The LWG's Section 2 comments (LWG 2014d) detail how each of these concepts is consistent with remediation regulations and guidance.

EPA Position:
See EPA's position to LWG's dispute issue 1r.

b. Similarly, RALs for each COC should be applied consistent with the exposure and potentially unacceptable risk areas defined for that COC in the BLRAs (e.g., RALs should not be applied where the exposure pathway or unacceptable risks for those COCs do not currently exist). This is consistent with the "risk-based framework" required by guidance, as cited above. The issue of RAL consistency with the BLRAs is also noted in the Comment 3.

EPA Position:
As EPA has stated many times to the LWG, the RALs are not risk-based (with the exception of Alternative H, which uses the PRGs as RALs). The RALs are concentrations of focused COCs only, but are meant to cover all COCs posing risk to various receptors at various spatial scales. Thus, the RALs in combination, not individually, are meant to address all COCs, not just the specific focused COC. The RALs, therefore, apply everywhere within the Site where any PRGs are exceeded. In conducting the evaluation of the alternatives, EPA looked at how each alternative met the PRGs. This was conducted for each RAO and was specific to the COCs, PRGs, and spatial scales relevant to that RAO. Both risk assessments show that PAHs contribute to unacceptable risk at the Site, not just from direct contact, but also as a dietary component.

Further, the EPA guidance does not require, but recommends 11 principles which principle 5 is "Use an iterative approach in a risk-based framework." The 11 principles guidance describes this principle broadly to include approaches that incorporate testing of hypotheses and conclusions and foster re-evaluation as new information is gathered, any early or interim actions planned or implemented at the site that address threats from contaminated sediment, or whether the proposed sediment remedy will be part of a larger phased approach to the site as a whole. EPA discussed how this principle was addressed in the memo sent to the OSRTI Sediment Team on October 22, 2015, which is part of the OSRTI Sediment Team review concurrent with the NRRB review process. **[AR Doc # 100012830]**

As discussed in guidance, this principle is meant to provide an iterative approach as information becomes available. EPA has used this approach throughout the RI/FS process to screen out contaminants not detected in the RI, screen out contaminants not posing risk after completion of the baseline risk assessments, and further screened out some contaminants that were posing potential risk at the Site in the FS based on information presented in the 2016 FS, Table 2.2-2. [See also updated version attached to this dispute.] However, some questions remain and data needs to be collected for other contaminants.

As stated above, EPA will only require action where contaminants exceed PRGs in a particular media. If the PRGs are attained in a particular area of the Site, then action would not be required. The 11 principles are silent as to the use of RALs since these are

not a required tool at sediment or other CERCLA Sites. The OSRTI Sediment Team did not provide any comments to the Region that there were deficiencies in the memo.

c. EPA presents a residual risk evaluation in Section 4 and indicates that the risks were calculated using methods consistent with the BLRAs. No details are provided on how the risk calculations where performed. Appendix H is entitled "Residual Risk Evaluation," but this appendix only contains a brief description of how time-zero SWACs were estimated on a rolling river mile basis. Additional information on the exposure assumptions, exposure point concentrations (for both sediment and tissue), and toxicity values is needed to evaluate consistency with the BLRAs. EPA's statement of consistency with BLRA methods is not enough to ensure that the methods are fully understandable or reproducible. Regardless, even based on the limited information presented, it is clear that EPA's methods are not consistent with the BLRAs in at least several respects. Examples include:
i. For human health sediment direct contact, time-zero SWACs were generated for shoreline areas (excluding the navigation channel) on a 1- river mile spatial scale, according to Appendix H. (However, the main text indicates instead that 0.5 river mile spatial scales were used. Also, Figure 4.2-1 suggests that EPA included the navigation channel in RAO 1 assessment, which would be incorrect.) Regardless, of how EPA actually did the assessment, sediment direct contact risks were evaluated in the BHHRA for shoreline half river miles, excluding the navigation channel.
ii. For human health fish consumption risks, SWACs were generated on a 1-river mile basis longitudinally split into the two shoreline areas and the navigation channel. However, in the BHHRA risks were evaluated by whole river miles with no longitudinal splitting for recreational fish consumption. Further, it is unclear which fish consumption scenario is actually being presented in the residual risk figures. If the subsistence fisher scenario is being presented, this was evaluated on a Site-wide basis in the BHHRA (not by river mile). The text on page 4-6 indicates that EPA calculated tissue concentrations from the SWAC estimates, but no tissue concentrations are presented. The text also indicates that these estimated tissue concentrations were compared to the PRGs for RAO 2. The LWG indicated in the Section 2 comments (LWG 2014b, 2015a, 2015b) disagreement with several aspects of EPA's tissue PRG calculations (and that such tissue levels should be classified as PRGs at all) because EPA was not consistent with the BHHRA methods.
iii. The human health residual risks for Alternative A are higher than the maximum risks calculated in the BHHRA, which indicates there are inconsistencies (residual risks should not be higher than baseline). The highest non-cancer risk for a breastfeeding infant in the BHHRA was 10,000. The residual risk assessment indicates the highest non-cancer risk for a breastfeeding infant would be 210,000.
iv. There is a significant disconnect between the BHHRA and residual risks for RAO 2 for dioxins/furans. For a breastfeeding infant, the highest hazard quotients for dioxin/furan TEQ calculated in the BHHRA were 10 on a Site-wide basis (tribal fish consumption, whole body diet) and 10 on a river-mile basis (recreational RME consumption, RM 7). Figure 4.2- 4c(1) indicates that the HQ from HxCDF alone (not the entire TEQ) is more than 14,000 for Alternative A. For a child, the highest hazard quotients for dioxin/furan

TEQ calculated in the BHHRA were also 10 on a Site-wide basis (tribal fish consumption, whole body diet) and 10 on a river-mile basis (recreational RME consumption, RM 7). Figure 4.2- 3f(1) shows a HQ greater than 30 for just HxCDF. The RfD has changed since the BHHRA was completed, but that does not account for the difference between the BHHRA and residual risks.

EPA Position:

EPA's residual risk evaluation is discussed in Appendix J of the 2016 FS. The approach used is consistent with the baseline risk assessments. RAO 1 was evaluated in shoreline areas only, not in the navigation channel, and evaluated on a half-river mile scale, which is consistent with the exposures in the BHHRA. RAO 2 was evaluated on both a Site-wide scale using PRGs based on a consumption rate of 142 g/day and one-river mile (including SDU) scale using PRGs based on a consumption rate of 49 g/day. While the exposure assumptions for RAO 2 are consistent with the risk assessment, EPA agrees that in the BHHRA risk was evaluated to the recreational fisher averaging tissue data across the river and the post-construction risk evaluated in the 2016 FS was on a river mile scale in river mile zones (east, navigation channel, west, and Swan Island Lagoon).

It is not uncommon and is acceptable to aggregate the data differently than evaluated in the baseline risk assessment in order to conduct a feasibility study that is evaluating the effect of cleanup of contamination in the river. The river mile data for the risk assessment were collected based on the home range of certain fish species, not the fishing pattern of the receptor. The risk assessment used river mile data for smallmouth bass composited across the river based on Round 1 data collected in 2002-2004. In 2005, ODFW conducted a radio tracking survey of several species and found that smallmouth bass are most commonly found in nearshore areas within a 1 km range of where they were released (ODFW 2005). Future sampling was then conducted for individual fish on either side of the river, but was aggregated in the same manner as the Round 1 data so that the data would still be comparable. Further, only smallmouth bass was used to assess risk on a river mile scale since other fish species were composited over a minimum of three miles. The 2016 FS calculated residual risk for all four fish species evaluated in the BHHRA based on a one river mile scale in the nearshore zone consistent with the preferred fish habitat and the assumptions of "recreational" fishers evaluated in the BHHRA. The calculated tissue concentrations are provided in Appendix J Table J1-2.

The 2016 FS was not attempting to replicate the BHHRA. There will be differences in the risks based on the methodology and data used. The BHHRA used fish data to assess the risk for RAO 2. The 2016 FS is using sediment data to predict a fish tissue concentration using the FWM and does not account for contaminant concentrations in water since the focus of the cleanup is the contamination in the sediment. Further, not all contaminants posing risk in this pathway were used in the residual risk assessment due to the inability to correlate sediment concentrations with tissue concentrations for some contaminants. The non-cancer risk for a breastfeeding infant of 10,000 in the BHHRA is on a Site-wide scale. The 2016 FS calculates that this risk would be 3,333. The non-cancer risk for a breastfeeding infant calculated in the 2016 FS only shows risk for this pathway greater

than 10,000 at RM 7W for HxCDF, where the maximum risk is 253,347 (see Table J2.3-5c). The BHHRA showed risks for this pathway at RM 7 was 200 based predominantly on PCBs (Table 5-108). The disparity in these values is due to the aggregation of the data. As stated above, the fish data were averaged across the river and only included one of the four species used to assess risk in the risk assessment. Further, the risk assessment only uses smallmouth bass data to calculate risk on a river mile scale and the lack of data for lower trophic level fish which have higher tissue concentrations underestimates the risk and is acknowledged in the uncertainty section of the BHHRA (Section 6.1.1.10). The 2016 FS used the FWM, which allows evaluation of risk from consumption of all four species; thus, the calculated risks would not be directly comparable to the BHHRA. The 2016 FS also uses average sediment concentrations in river zones calculated on a one-river mile scale. The assumption then is that the fish are exposed to that concentration. Therefore, the analysis in the 2016 FS is based upon the representativeness of the data.

v. Continued exclusion of the site use factor from the BHHRA for BaPEq RAO 1 PRG (106 µg/kg) results in concluding that not even Alternative G will result in SWACs meeting the PRG at time zero in east and west river miles (per EPA's Table 4.2-1). However, if the BHHRA site use factor is accurately applied to this PRG (424 µg/kg), Alternative A appears to achieve RAO 1 in all East RMs (according to EPA's Figure 4.2-7b).

EPA Position:
A factor of 25 percent (which corresponds to a site use factor of 4) was used for direct contact to sediment in the BHHRA to account for the time spent fishing in any single area within the Site. Therefore, the total risk to the fisher is based on any four areas of the Site. Thus, the maximum direct contact risk to the fisher from the BHHRA is 1×10^{-4} and HI=3. The PRGs developed in the 2016 FS are meant to be applied Site-wide and are established at a 1×10^{-6} risk level or HI=1, consistent with the NCP and ARARs. While the application of site-use factor may be appropriate assess the risk within a specific area, PRGs are intended to be applied uniformly to each area because actual activity patterns are not known. When potential exposure at more than a single area is considered likely, use of a site-use factor is no longer protective. Further, applying the use factor as suggested by the Respondent would still result in areas in the east river miles exceeding PRGs (see 2016 FS Table J2.2-1c).

vi. Residual risk figures should show and Section 4 should discuss human health risks compared to a 10-4 threshold in addition to the 10-6 threshold to fully evaluate the range of effectiveness. EPA's Section 2 presents PRGs calculated on both a 10-4 and 10-6 thresholds. EPA should evaluate alternatives in the entire acceptable risk range (10-4 to 10-6) against the FS evaluation, not just variations of RALs all targeted at 10-6 or lower risk.

EPA Position:

Residual risk is defined as the risk remaining once PRGs are achieved. Therefore, residual risk is calculated as the cumulative risk based on the selected PRGs. PRGs are calculated assuming a 1 x 10^{-6} risk or HQ of 1 and ARARs consistent with the NCP. The exceptions are where background concentration (based on EPA guidance on background) or analytical quantitation limits (per NCP) are greater than the risk-based PRGs or ARARs are not sufficiently protective. As discussed above, RALs are not established at risk levels but are established at levels greater than the PRGs. The 2016 FS does discuss the ability of each of the alternatives to achieve the 10^{-4} carcinogenic risk level as an interim target post construction to ensure that even if PRGs are not achieved, the residual risk is within EPA's acceptable risk range.

vii. For ecological sediment direct contact, SWACs were generated on a 0.2-mile basis with longitudinal splitting. This spatial scale may or may not be representative of the combined lines of evidence approach used in the BERA to assess benthic risks, given areas of benthic risk were defined for various sized clusters of sampling stations. Further, the hazard quotients presented in the figures appear to be generated by simply dividing the SWAC by the individual PRGs in Section 2, which are mostly based on generic literature Probable Effects Concentrations (PECs). The LWG has already commented on Section 2 (LWG 2014b, 2015a, 2015b) that use of the individual PECs is not consistent with the BERA determinations of benthic risks using multiple lines of evidence.

EPA Position:
The purpose of the FS is to evaluate cleanup options, not establish risk. The BERA used several lines of evidence to evaluate risks to benthic receptors present at the site and concluded that contamination posed unacceptable risk. Therefore, cleanup goals are developed to ensure that the identified risks at the Site are addressed. The evaluation of residual risk is based on the risks remaining once PRGs are achieved. In the 2016 FS, RAO 5 was changed from direct contact to benthic risk. The COCs are based on the BERA recommendation to base the remedy on the ecologically significant COCs (see Section 11 of the BERA). The PRGs for this RAO were based on the BERA SQVs as recommended by the NRRB/CSTAG. The PRGs are mapped in the 2016 FS against the benthic stations to ensure that the contaminant was contributing to benthic risk and then aggregated to compose the comprehensive benthic risk area (see 2016 FS, Appendix D11).

viii. For ecological bioaccumulation risks, SWACs were generated on a 1-river mile basis with longitudinal splitting. However, the receptors that appear to be used in the residual risk calculations were evaluated over various exposure spatial scales. For example, osprey egg assessment appears to be the receptor of choice for dioxin/furans and DDE, and osprey exposure was assessed in the BERA on a much larger spatial scale than 1 river mile. Thus, it is unclear how EPA's one spatial scale assessment can be consistent with all of these various BERA assessments. Further, the LWG has already commented for Section 2 that some of the receptors EPA focuses on for RAO 6 PRG development, and EPA presumably is focusing on for this residual risk assessment, are

inappropriate and inconsistent with the BERA for reasons detailed in those past comments (LWG 2014b, 2015a, 2015b).
ix. The statement in Section 4.1.6.1 that "ecological hazard quotients are calculated using the estimated sediment concentrations and the riskbased PRGs for RAOs 5 and 6, consistent with the process used in the BERA" is misleading in its claim that RAO 5 and 6 PRGs are risk-based. The assertion that this EPA process used to calculate ecological hazard quotients is consistent with the BERA is obviously wrong because ecological hazard quotients that EPA reports in Section 4.2.1 for alternative A (no action) are much higher than BERA HQs. The residual risk assessment is also apparently inconsistent with the BERA in its use of "ecological hazard indices," although this is unclear because EPA has not defined the term.

EPA Position:
The 2016 FS was not attempting to replicate the BERA. There will be differences in the risks based on the methodology and data used. The BERA used biota data to assess the risk for RAOs 5 and 6 and used discrete river mile boundaries within the Site based on ecological exposures to aggregate the data. The 2016 FS is using sediment data to predict a tissue concentration using the FWM or BSAFs/BSARs and used incremental boundaries based on the same relevant exposure spatial scale as the BERA. Further, not all contaminants posing risk via this pathway were evaluated in the residual risk assessment due to the inability to correlate sediment concentrations with tissue concentrations. The disparity in HQs in the BERA and those in the residual risk estimate is due to the aggregation of the data and the models used to predict tissue concentrations. Further, the Respondents have not identified which ecological hazard quotients they believe are "much higher" than the BERA HQs. No "ecological hazard indices" are used in the 2016 FS.

x. The residual ecological risk assessment is inconsistent with the BERA in asserting that riverbank soil poses risk. No analysis is provided to back up this assertion and no analysis of riverbank soils (as defined in the RI) were assessed in the BERA.

EPA Position:
EPA agrees that the BERA did not assess risk from exposure to river bank soil in the BERA. The 2016 FS does not conduct a residual ecological risk assessment. The 2016 FS conducts an evaluation of residual risk under long-term effectiveness as required by the NCP and EPA guidance. The river bank soil/sediment poses a risk of recontaminating the sediment, which is where exposure occurs. As stated on p. 2-8 of the 2016 FS:

RAO 9 – River Banks: Reduce migration of COCs in river banks to sediment and surface water such that levels are acceptable in sediment and surface water for human health and ecological exposures. Reducing concentrations, exposure to, and the bioavailability of the COCs in river banks will reduce risk and recontamination at the Site. Ongoing source control efforts will provide additional risk and recontamination reduction.

xi. Despite EPA providing few method details, these aspects of EPA's residual risk methods can be shown to be inconsistent with the BLRAs. This suggests it is highly likely that other details of the methods, if they were known, would also be inconsistent with the BLRA methods.

EPA Position:
The methodology used to evaluate residual risk is provided in Appendix J of the 2016 FS.

The fact that EPA finds the B and D RALs themselves (as well as a new "PTW" RAL) protective in certain areas of the site demonstrates that, as the LWG has previously commented,17 EPA's approach does not narrowly tailor required cleanup activities to actual site risks identified through the risk assessments. EPA has selected some cleanup criteria that may be applicable to certain locations (or facies) and applied them inappropriately in others. For example, the use of TPAH RALs within the navigation channel is technically inappropriate because the BLRAs did not identify potentially unacceptable risk from this class of chemicals (beyond the extent to which benthic risk identified in the BERA may correlate with PAHs) except in nearshore areas where direct contact or shellfish harvesting might potentially occur. EPA's application of E RALs in some but not all parts of SDU 3.5E results in the identification of a Sediment Management Area for PeCDD where the current SDU 3.5 SWAC already meets the most conservative PeCDD PRG of 0.0002 ppb for RAO2 (fish consumption on a river mile basis).18 In addition, the differential application of PAH RALs results in unjustified differential postconstruction risk. A larger remedial footprint results from the Alternative I using a 35,000 ug/kg TPAH RAL near outfall OF53A in SDU2E, whereas PAH-driven remedial actions in some other parts of the river have smaller footprints using a TPAH RAL of 69,000 ug/kg. The rationale for more extensive cleanup for PAH near OF53A and its net benefit is not explained.

EPA Position:
First, the LWG's issue appears to inflate the role of the RALs versus the PRGs. The RALs are not cleanup criteria as the LWG categorizes them but rather different removal (dredging or capping) concentration levels of the focused COCs for alternatives analysis of risk reduction. Since RALs are not risk-based, it is reasonable to evaluate specific SDU characteristics, particularly the driver COCs to determine what level of active cleanup would result in the most cost-effective risk reduction.

In conducting the detailed evaluation of alternatives on smaller spatial scales in 2015, EPA realized that some areas of the river could require less aggressive active cleanup (more ENR/MNR) while other areas required more aggressive active cleanup (more capping/dredging). Different RALs were selected in various areas of the Site for Alternative I due to the attainment of PRGs based on specific RAOs in some areas upon completion of construction at the applicable spatial scale of the PRG. The basis for Alternative I using the RALs from Alternative B plus PTW concentrations were that only Alternative B was needed to achieve the cumulative risk interim goal in SDU 6NAV for RAO 2 (see Table 4.2-1); however, all PTW needs to be addressed to ensure the mobile

source material is reliably contained. The fact that EPA seeks to identify that some RALs would achieve a more protective post-construction risk reduction in some areas of the Site while others were necessary in other parts of the Site shows that EPA's approach does narrowly tailor the required cleanup activities to actual Site risks that the LWG argues should be done.

Issue 3. Remedial Action Levels – The LWG disagrees with EPA's dioxin/furan, TPAH, and DDx RALs for reasons discussed below. Also, the problematic absence of any evaluation of benthic risks as part of alternative development in Section 3 is discussed in Comment 3d.
a. Dioxin/Furan RALs – The LWG does not agree that dioxin/furan RALs are necessary to define SMAs or select an effective remedy for the Site. EPA's Table 3.7-1 shows that the percent reduction in time-zero Surface-area Weighted Average Concentrations (SWACs) calculated by EPA for three dioxin congeners. The TCDD and PeCDD SWAC reductions for Alternative G are in the 60- to 70-percent range, which is a relatively low percent reduction as compared to the other RAL chemicals in the table. In contrast, the SWAC reduction for PeCDF starts at 89 percent for Alternative B and ends at 97 percent for Alternative G, which indicates that the range of RALs provides no meaningful differentiation in SWAC reduction for this congener. EPA has indicated (orally on August 27, 2015) that this is due to the paucity of data on detected dioxin/furan at the Site. However, the low data density and high non-detect frequency for the dioxin/furan dataset should be a reason to reconsider the value of dioxin/furan RALs, rather than a reason to explain the poor performance of such RALs. The insignificance of these SWAC reductions is more clearly illustrated by comparing the dioxin/furan SWACs achieved to EPA's own dioxin/furan PRGs by calculation of a SWAC exceedance factor—a factor above the PRG. This can be illustrated by comparing SWAC exceedance factors with and without EPA's proposed dioxin/furan RALs as shown in the tables below. The tables show that a RAL set that includes dioxin/furan RALs does not get the remedy meaningfully closer to acceptable risk levels as represented by EPA's PRGs. Details of this analysis can be provided. (EPA indicated orally on August 27, 2015, that EPA does not evaluate Site-wide SWACs, only SWACs on a rolling river mile basis. This is clearly incorrect given that the evaluation of each alternative in Section 4 starts with a presentation of Site-wide time-zero SWACs. ~~Also, EPA's own dioxin/furan PRGs are based on the osprey egg endpoint, which is assessed on a Site-wide spatial scale in the BERA.~~ [Sentence stricken per LWG request – see Attachment 1, 2015-10-08 FS Section 3 and 4 LWG Significant Issue Clarifications, 3rd bullet] *Thus, the Site-wide spatial scale is actually the most relevant scale for an analysis of dioxin/furan RALs.) For example, for PeCDD, Alternative F without dioxin/furan RALs achieves SWACs 310 times greater that EPA's PeCDD PRG, while adding the dioxin/furan RALs achieves SWACs for this same alternative that are still 256 times above the same PRG. (Also, conducting this evaluation on a rolling river mile basis would not change this conclusion. Specific rolling river miles would range much further above the PRG than this Site-wide assessment.) Similarly, the addition of the dioxin/furan RALs only slightly reduces the SWAC exceedance factors for PeCDF and TCDD across all alternatives, and none of the alternatives are estimated to achieve SWACs that are below those PRGs.*

5 Per EPA's website (http://www.epa.gov/superfund/health/contaminants/dioxin/dioxinsoil.html): "For example, the PRG calculated using the new RfD of 0.7 pg/kg-day (picogram per kilogram-day) and EPA non-adjusted exposure factors would be 50 parts per trillion (ppt) toxicity equivalence (TEQ) for residential soil and 664 ppt TEQ for commercial/industrial soil."

SWAC Exceedance Factor above the PRGs – without EPA's Dioxin/Furan RALs Alternative PeCDD PeCDF TCDD

Alternative	PeCDD	PeCDF	TCDD
B	409	2.3	9.4
C	407	2.3	9.4
D	401	2.3	9.3
E	360	1.8	6.7
F	310	1.7	6.0

SWAC Exceedance Factor above the PRGs – with EPA's Dioxin/Furan RALs Alternative PeCDD PeCDF TCDD

Alternative	PeCDD	PeCDF	TCDD
B	354	2.1	6.6
C	341	2.1	6.5
D	314	2.0	6.3
E	293	1.4	5.8
F	256	1.3	5.5

Also, for all of the dioxin/furan RALs EPA uses the exact same RAL numeric value to represent more than one alternative. For example, for TCDD, EPA proposes using the same RAL value of 0.002 µg/kg for Alternatives B, C, and D and the same RAL value of 0.0006 µg/kg for Alternative E, F, and G. This approach substantially constrains the alternatives from providing any meaningful changes in SWAC reduction or the SMA shapes and areas defined. Essentially, EPA is only providing three alternatives with regards to dioxin/furans. This appears to conflict with EPA's approach where the RALs (as opposed to technology assignments discussed in Comment 1) are the only real difference among alternatives. Thus, in the case of dioxin/furans, the alternatives have no variation in technology assignments and very little meaningful variation in term of RALs as well.

EPA Position:

Section 5.2.3.1 of the RI Report states that the PCDD/F data set is limited (about one-fifth the size of other contaminant data sets) and cautions in making conclusions regarding the spatial patterns of the composition of total PCDD/Fs in sediment. Thus, EPA acknowledges there are limitations in how the RALs perform based on the current data. Based on existing data and the risk assessments, dioxins/furans pose the second greatest risk within the site to both human and ecological receptors. As such, the risks from this contaminant group must be addressed at the Site. The RALs for other focused

COCs do not sufficiently cover the dioxins/furans posing risk from exposure to sediment. However, the dioxin/furan sediment data collected by the Respondents is sparse and large areas of the Site were not sampled for dioxin/furans; thus, not characterized. The lack of data is not a basis for excluding these contaminants from the cleanup options presented in the 2016 FS. EPA explains in Section 3.4.1.2 of the 2016 FS the basis for some of the dioxin/furan RALs being the same in more than one alternative. Furthermore, the alternatives are developed as a combination of RALs, not individual RALs, and while the alternatives may not differ with respect to some of the dioxins/furans, they do differ with respect to other contaminants.

The 2016 FS only applies RALs where those concentrations are exceeded in sediment based on the RI data. As EPA has stated above, RALs are applied in combination to develop SMAs that cover all COCs in sediment greater than PRGs. EPA's applications of the E RALs in SDU 3.5E results in an estimated 1,2,3,7,8-PeCDD sediment concentration of 0.000125 µg/kg (see Table J2.3-7 in the 2016 FS). The 1,2,3,7,8-PeCDD PRG for RAO 2 is 0.0002 µg/kg (see 2016 FS Table 2.2-1). While the 1,2,3,7,8-PeCDD PRG is achieved post-construction for this alternative, other COCs are not. As shown in the 2016 FS, Table J2.3-8b, the residual risk for Alternative E in SDU 3.5E is 1×10^{-4}.

The 2016 FS developed dioxin/furan PRGs based on the relevant spatial scale for the RAO. Some of these are Site-wide, while others are at smaller spatial scales. However, in selecting PRGs for each of the RAOs, the most protective PRG is selected and applied at all relevant spatial scales.

b. TPAH RALs – Per discussions at the 2014 FS technical meetings, the LWG disagrees that TPAH RALs should be used instead of cPAH RALs (expressed as BaPEq). BaPEq is consistent with the methods and results of the BHHRA, which were assessed in terms of total cancer risk from cPAHs on a BaPEq basis. Following the risk-based approach called for in the guidance,6 RALs should be consistent with the methods and findings of the BLRAs to ensure that sediment remedies are "risk-based" (i.e., result in effective risk reduction). Further, EPA's latest Section 2 human health PAH PRGs are all expressed as BaPEq. Therefore, use of BaPEq RALs allows for a direct comparison on a consistent basis between the RALs and the PRGs, whereas TPAH RALs do not. Further, the use of BaPEq RALs for human health and Comprehensive Benthic Risk Areas (CBRAs)7 for ecological risks addresses all of the PAH-related potentially unacceptable risks found in the BLRAs. Also, the BaPEq RALs should only be applied to human health exposure areas outside the navigation channel consistent with the risk-based approach called for in the guidance. The cPAH risks related to sediment direct contact and shellfish consumption exposures occur only outside the navigation channel (along the shoreline), and as a result, BaPEq RALs associated with these potential risks should be applied in these areas only. The only remaining human health potential unacceptable risk identified in the BHHRA was for the fish consumption scenario, which was determined using cPAH concentration data in fish tissue. There is no valid relationship between cPAH fish tissue and sediment concentrations at the Site, or any other sediments site, due to the rapid metabolism of PAHs by vertebrate fish (see LWG 2014d, 2015a, 2015b for additional

details and references). Carcinogenic PAHs represent less than 1% of the cumulative risks to people eating fish and are, therefore, not a good reason to expand the remedy by hundreds of millions of dollars on the basis of a technically inappropriate PRG, given that there is no reasonable expectation that such an expansion could have any meaningful impact at all on the overall fish consumption risk. Because the BaPEq RALs can only be linked to effective risk reduction along the shoreline (using the BHHRA findings and the resulting appropriate PRGs for sediment direct contact and shellfish consumption), these RALs should only be applied along the shoreline outside of the navigation channel.

6 EPA guidance (2005a) discusses "Risk Management Principles and Remedial Approaches" and clearly describes that the cleanup should use a "risk-based framework"; "select site-specific, project-specific, and sediment specific risk management approaches that will achieve risk-based goals"; and "ensure that sediment cleanup levels are clearly tied to risk management goals" (p. 1 – 5).
7 See Comment 15 for more details on the LWG's position regarding benthic risk and EPA's removal of the CBRAs from the revised FS.

EPA Position:
Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different individual PAH compounds (ATSDR). Total PAHs were evaluated in the BERA and include the combination of 17 individual PAH compounds. The conclusions of the BERA was that total PAHs were ecologically significant at the Site (see BERA Table 11-5). There is nothing in the BERA that states that there is no risk from PAHs in the navigation channel. There is also nothing in the BERA that states that there is no exposure or risk to aquatic organisms in the navigation channel. To the contrary, the BERA identifies PAHs as a contaminant contributing to risk in almost every species evaluated in the BERA. The BHHRA only evaluated those individual PAHs which are cancer causing (16 individual PAH compounds). The BHHRA concludes that PAHs contribute to risk from consumption of fish in addition to risks from consuming shellfish and direct contact. The RALs are not risk based and are applied to all areas of the Site where they are exceeded. The evaluation of the alternatives evaluates those contaminants that are posing risk for each RAO by comparing the appropriate post construction contaminant concentrations to the PRGs for each RAO at the appropriate spatial scale in the Site. Residual risk and post construction risk for RAO 1 was not evaluated in the navigation channel since EPA agrees that this RAO is not applicable to that area of the Site; however, all other RAOs are and were evaluated in the navigation channel. RAOs 1 and 2 evaluate post construction cPAH concentrations to cPAH PRGs while RAO 6 evaluates post construction total PAH concentrations to total PAH PRGs. Additionally, there is no difference between the cPAH RALs developed by the LWG in the 2012 FS and the total PAH RALs used by EPA in the 2016 FS. EPA simply took the cPAH RALs developed by the LWG and converted them to total PAH using the regression analysis of the cPAHs at the site to total PAHs in sample pairs (see 2016 FS, Appendix D5).

The application of RALs in various parts of the river will result in differential post construction concentrations risks based on the remaining concentrations of different COCs in the area being evaluated. The basis for selecting E RALs for SDU 2E in Alternative I is based on the resulting residual risk from all COCs, not just PAHs. PCBs is the driving the risk in this area of the Site. As stated above, the RALs act in combination, not independently, in development of the alternatives. EPA is applying different alternatives (which are combinations of RALs) for Alternative I, not different individual RALs, in various parts of the river. The only area where D RALs was selected in Alternative I is SDU 6W. This area has a much greater SMA footprint from PAHs that SDU 2E since the PAHs are driving the risk in this area of the Site.

c. DDx RALs – Although the LWG agrees with the use of DDx RALs as a general concept8 instead of individual DDD, DDE, and DDT RALs in the 2012 draft FS, the LWG disagrees with the upper end of the RAL curve selected by EPA. There is little differentiation in the areas mapped using EPA's B, C, and D RALs. For example, according to EPA's Table 3.3-4, within the RM 7W area, the acreages defined by EPA's DDx RALs for Alternatives B, C, and D are 10, 12, and 15 acres, respectively. EPA further indicates these RALs achieve Site-wide SWACs of 21, 20, and 19 ppb, respectively. Thus, this range of RALs represents virtually no substantial difference in areas remediated or risk reduction likely achieved. Instead, EPA should use DDx RALs of 8000, 1000, and 500 µg/kg for Alternatives B, C, and D, respectively. This RAL set would provide a wider differentiation between the active remediation acres and resulting SWACs achieved across these three alternatives. In addition, the LWG has the following specific concerns about EPA's DDx RAL analysis:
i. Table 3.3-4 presents an inappropriate comparison of DDx RALs to a SWAC derived for a localized area of RM 6.6 to 7.8. EPA does not explain the basis for evaluating DDx across this area rather than an area that is consistent with the spatial scale evaluated in the BLRAs most related to appropriately calculated DDx PRGs. As noted above, RALs should be developed consistent with the BLRAs to be consistent with FS guidance.
ii. The LWG's original position in 2011 was to use DDE RALs as a surrogate for DDD and DDT (and as a result, for total DDx). However, EPA expressed concerns in 2011 and again in 2014 FS technical discussions that the DDE RALs, by themselves, might not sufficiently bound areas of elevated DDD and DDT sediment concentrations. No supporting technical basis was provided by EPA for this concern, and none is provided in Sections 3 and 4. The determination of bounding COCs for RAL development is an evaluation that requires best professional judgment that must be clearly explained. In addition, the 2012 LWG draft FS indicates that potentially unacceptable risks associated with DDx are based only on the most conservative fish consumption pathway and are localized to RM 7, where DDx contributes only 3% of the cumulative potentially unacceptable risks. Given that EPA does not explain the reasons for the conversion from separate RALs to one combined set of DDx RALs, the LWG's proposal above may not fully resolve the LWG's concerns regarding EPA's DDx RAL approach.
d. Comprehensive Benthic Risk Areas – EPA makes no mention of the CBRAs in the FS Section 3 text or how those risks are addressed through the proposed RALs and SMAs.

See Comments 15 and 17 for more information regarding the LWG's position on benthic risk and need for consistency with the risk assessments.

8 However, the LWG does not necessarily agree with how EPA made the conversion from separate RALs to a combined DDx RAL or with the EPA's DDx RAL values as noted further below in this comment.

EPA Position:
While the Respondents did not disagree with the use of DDx RALs, they are disputing the RALs used by EPA for Alternatives B, C, and D. EPA used the following RALs in the 2016 FS:

Table 3.4-4
DDx RALs with Resulting SWACs and Acres
Portland Harbor Superfund Site
Portland, Oregon

DDx					
		RM7W		Site Wide	
Alternative	RAL (µg/kg)	SWAC (µg/kg)	Acres	SWAC (µg/kg)	Acres
B	650	100	10	22	11
C	550	85	12	21	13
D	450	65	15	20	16
E	300	37	20	18	22
F	160	22	25	16	33
G	40	10	35	11	114
H	6.1	6	64	6	1,130

The Respondents argue that EPA should use DDx RALs of 8,000, 1,000, and 500 µg/kg for Alternatives B, C, and D, respectively, and that this RAL set would provide a wider differentiation between the active remediation acres and resulting SWACs achieved across these three alternatives. The current Site-wide SWAC for DDx is 52 µg/kg and the current RM 7W SWAC is 640 µg/kg. The suggested RALs from the Respondent would equate to the following SWACs and acres remediate:

Site-wide SWAC:

Alt	Rals	postSWAC	Acres
B	8000	38.72	1.22
C	5000	34.74	1.95
D	500	20.42	14.05

RM7W SWAC:

Alt	Rals	postSWAC	Acres
B	8000	373.9	1.22
C	5000	306.3	1.95

D	500	74.5	13.39

As the above analysis demonstrates, this contaminant is very localized in one area of the Site – RM 7W, as shown by the acres addressed by RALs. Table 3.4-4 and Figure 4.3-12 in the 2016 FS also shows this. Further, the LWG acknowledge this in their 2012 FS [**AR Doc # 706171**, Section 4.1, p. 4-4]:

Sum-DDE, particularly due to relatively localized potentially unacceptable risks near RM 7 to human health via fish consumptions (either smallmouth bass or large home range fish).

Sum-DDD due to relatively localized potentially unacceptable risks near RM 7.

Sum-DDT due to relatively localized potentially unacceptable risks near RM 7.

The B and C RALs only address contamination at RM 7W (as shown by the acreage Site-wide being the same as those at 7W). Very little area (1-2 acres) would be addressed using these RALs and the Respondents do not provide a basis for why selecting RALs at these concentrations would be meaningful in reaching the PRG of 6.1 µg/kg. Based on the uncertainty evaluation in the 2016 FS, Appendix I, the RALs suggested by Respondents for Alternatives B and C would not be statistically discernable from the no action alternative based on the variability of the data. Therefore, there would not be any "meaningful risk reduction" through selection of these RALs. Further, RALs are developed to address contaminant concentrations in the Site and are not based on risk – only PRGs are based on risk. However, the evaluation of the application of the RALs in reducing risk is conducted on spatial scales consistent with the baseline risk assessments.

EPA has had several discussions with the LWG and have provided comments regarding the use of DDE RALs dating back to June 2011. **[AR Doc # 100015899 and 100007242]** In all the discussions and comments provided by EPA between 2001 and 2015, EPA did not merely raise concerns but also provided technical information to support EPA's determination that DDE RALs do not sufficiently address all risk from DDD, DDE, and DDT. EPA also provided a document presenting maps of RAL options to the LWG as early as July 27, 2011. **[AR Doc # 100033475, 663228, 663260]** Further, on August 11, 2011, EPA directed the LWG to use DDx RALs in the 2012 draft FS and the LWG did not dispute this direction at that time. **[AR Doc # 663242 and 663285]** The LWG never provided any information on why using DDE RALs as a surrogate for DDD and DDT is appropriate or reasonable. Both the BHHRA and BERA address risk to receptors as DDx; only the exposure to surface water used DDE, DDD, and DDT and bird egg assessments used DDE. The basis for using DDx is that it is directly comparable to the risks in the river and the only reason EPA developed RALs individually for DDD, DDE, and DDT were so the LWG could model them in their fate and transport model. The FS is a technical document that has the sole purpose of developing and evaluating alternatives and is not a document that is used to discuss the differences between the EPA and LWG

FS documents. EPA has had many discussion with the LWG over issues with their 2012 FS and have incorporated EPA's final determination on those in the 2016 FS.

e. EPA indicates in Section 3 that the RALs were selected using RAL curves and considering the zone of maximum incremental SWAC reduction, the zone of marginal incremental SWAC reduction, the knee of the curve, and spatial distribution of the RAL points on the curve. The LWG generally agrees with these RAL selection criteria, which are similar to those stated in the 2012 draft FS. However, a cursory review of the RAL curves presented indicates a wide difference in the RAL points chosen along these curves across the various chemicals. Considering the EPA stated selection criteria either individually or together, there is no discernable consistency in the RAL points selected on the curve for one chemical to the points on the curve selected for another chemical. Thus, the stated selection criteria do not appear to be followed.

EPA Position:
In the 2016 FS, there is no selection criteria for the RALs (refer to Appendix D1), as stated by the Respondents. EPA notes that there are points on the curves that are considered (the zone of maximum incremental SWAC reduction, the zone of marginal incremental SWAC reduction, the knee of the curve, and spatial distribution of the RAL points on the curve) but does not use these are rigorous selection criteria. The PCB and PAH RALs were selected by the LWG and carried forward into the 2016 FS. The DDx RALs are based on localized contamination and, therefore, the selection of RALs had to be carefully selected to ensure a broad range of footprints could be evaluated. The 2016 FS clearly describes the methodology for selecting the dioxin/furan RALs and why those differed from selection of the other RALs.

Issue 15. Inappropriate Benthic Risk Analysis – EPA does not mention benthic community risks in the Section 3 RAL, SDU, or SMA development text (as noted in Comment 3). EPA must develop and evaluate alternatives that fully consider benthic risks using methods that are consistent with the BERA. Although EPA conducts an extensive SDU analysis to assess whether the selected RALs bound other risk pathways, EPA does not discuss the extent to which these RALs are expected to bound and address benthic community risks. In contrast, the 2012 draft FS included a detailed evaluation of and determination of benthic risk SMAs using the CBRA approach, as required by EPA at the time.

Then in Section 4, EPA evaluates the alternatives for their ability to adequately address benthic community risks. EPA concludes that all the alternatives do not address through active remediation a "substantial" portion of the benthic community risks. For example, EPA states for Alternative G, "There are a substantial number of locations where unacceptable benthic risk (identified via bioassays or predicted via the Logistic Regression Model [LRM]) are not encompassed by the areas of construction as shown on Figure 4.2-11." EPA states that the remaining benthic risks will be addressed through MNR. While it is reasonable to address low-level risks through MNR (including benthic risks), EPA has constructed alternatives that ignore benthic risk and then demerits those

same alternatives in the effectiveness evaluation for failing to adequately address benthic risks.

EPA's benthic risk approach is particularly inconsistent given that EPA made multiple changes to the RALs between the draft and revised FS because EPA deemed the 2012 draft FS RALs for PAHs, DDE, and dioxin/furans as "not protective." This decision resulted in extensive work to recalculate all the SMAs and alternative quantities and costs. EPA does not attempt to explain in Section 4 whether EPA could have avoided all of this rework and instead similarly decided that MNR would address relatively low-level risks for PAHs, DDx, and dioxin/furans that EPA deemed were not directly addressed by the 2012 draft FS RALs. There are some important additional technical issues with EPA's benthic risk approach as follows:

a. EPA's method for defining benthic risks requires additional explanation. EPA provides one figure series (Figure 4.2-11 and Figures 4.2-14 through 17) and two statements regarding the methods used: 1) "Identified via bioassays or predicted via the LRM"; and 2) "Additionally, benthic risk is evaluated by determining the percentage of measured or predicted benthic toxicity points addressed by the construction of the alternative." The term "toxicity points" is new and not defined. Consequently, these results are not reproducible and the subsequent, related conclusions appear unsupported.
b. From examination of the cited figures, it appears that EPA used any instance of a Level 2 or Level 3 bioassay hit and any exceedance of the LRM benthic screening levels to determine that "benthic risk" was present at any given sampling station. The BERA is clear that individual benthic toxicity lines of evidence are insufficient to fully characterize benthic risks at the Site.

14 EPA guidance states:
*"As a general policy and in order to operate a unified Superfund program, EPA generally uses the results of the baseline risk assessment to establish the basis for taking a remedial action using either Section 104 or 106 authority. *** If the baseline risk assessment and the comparison of exposure concentrations to chemical-specific standards indicates that there is no unacceptable risk to human health or the environment and that no remedial action is warranted, then the CERCLA Section 121 cleanup standards for selection of a Superfund remedy, including the requirement to meet applicable or relevant and appropriate requirements (ARARs), are not triggered."*
In other words, where the baseline risk assessment concludes that a human or ecological receptor will not be exposed to potentially unacceptable risk by a contaminant present in a given media, there is no basis for taking remedial action. Where no remedial action is warranted, development or refinement of preliminary or final remediation goals is unnecessary. Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, p.3 (OSWER Directive 9355.0-30, April 22, 1991).
15 See, LWG, List of Significant Issues with EPA's Revised FS Sections 3 and 4 (September 8, 2015), Issue 17 at pp. 44-48. (included within Attachment 1). The LWG's comments on the August 2015 FS are included as Attachment 1 and incorporated by reference.

16 For example, the uncertainty analysis in Appendix I concludes that Alternative B is statistically indistinguishable from the no action alternative. This disagrees with figures in Section 4.2 that shows that the biggest drop in HQ and cancer risk is from the no action alternative to Alternative B as compared to the other alternatives.
17 See, LWG, List of Significant Issues with EPA's Revised FS Sections 3 and 4 (September 8, 2015), Issue 3 at pp. 9-13 (included within Attachment 1).
18 See, e.g., Table 4.2-1 of EPA's August 2015 FS.

EPA Position:
EPA developed a comprehensive benthic risk area based on the PRGs for RAO 5 in the 2016 FS. This area is presented in Figure 4.4-1 and development of it is presented in Appendix D11. Section 3 of the 2016 FS discusses the development of the alternatives; evaluation of the alternatives, including how risks are addressed through the proposed RALs and SMAs, is discussed in Section 4. EPA did not use benthic risk as a basis for development of alternatives as EPA did not develop RALs for all other COCs. The focused COCs were chosen based on their coverage of other COCs, including those for RAO 5. None of the alternatives address all the risks at the Site through construction, with the exception of Alternative H. In the evaluation of alternatives in Section 4, EPA discusses those risks that are not addressed by the construction of the alternatives so that it is clear how much risk was addressed and how much remains to be addressed through MNR. EPA does not "demerit" or characterize this evaluation as a "failure" for any of the alternatives.

LWG Dispute Issue 1e:
Other EPA revisions and changes between the August 2015 and June 2016 drafts of the FS that diverge without explanation from the RI and BLRA (and from each other) include:

On page 1-24, EPA identifies 66 COCs posing unacceptable ecological risks and determines that 20 of these COCs "pose risks ecologically high enough to consider development of a remedial action." EPA presents no details of how this risk management decision was made and or how it is consistent with the Baseline Ecological Risk Assessment (BERA).

EPA Position:
The BERA, in Section 11.4, presents Contaminants of Ecological Significance and concludes:

"All contaminants posing potentially unacceptable risk at the end of the BERA were recommended to be carried forward to the FS. Those classified as posing ecologically significant risk in Table 11-5 are recommended for consideration in developing and evaluating remedial action alternatives in the 2016 FS based on the pathways and factors considered in the BERA. Contaminants posing potentially unacceptable risk at the end of the BERA that are not listed in Table 11-5 are recommended for comparison with pro[t]ected post-remedial action conditions to confirm that alternatives developed for the

ecologically significant contaminants would be protective for risks of low ecological significance."

Therefore, this risk management decision was carried forward from the recommendation made in the BERA and is therefore consistent with the BERA. EPA made risk management decisions in Section 2 of the 2016 FS as to which COCs would be evaluated further in the 2016 FS (see Table 2.2-2).

LWG Dispute Issue 1f:
The 2,4' and 4,4'-DDD, -DDE, -DDT (DDx) PRG for RAO 6 decreased substantially and is now based on sculpin tissue residue instead of sandpiper.

EPA Position:
The DDx PRG for RAO 6 is based on the sculpin tissue residue (760 µg/kg) rather than the spotted sandpiper (2,849 µg/kg). As discussed by EPA in Section 2.2.2.2 of the 2016 FS (p. 2-11), the lowest PRGs was selected for each COC to ensure protection of all species.

LWG Dispute Issue 1g:
EPA's proposed background values are still based on inappropriately derived upstream bedded sediment statistics that are unlikely to represent achievable cleanup levels for the site as they do not account for anthropogenic influences, which are known in the scientific literature to exist throughout the Willamette basin.19 The FS also does not present background concentrations for surface water and does not present sediment background concentrations for all chemicals with sediment Preliminary Remediation Goals (PRGs).

EPA Position:
Background calculations for sediment were developed as part of the Remedial Investigation Report, not the Feasibility Study, except for dioxins/furans. Under the RI/FS AOC, the LWG formally disputed EPA's directions on the statistical approach for calculating background. On March 24, 2015, EPA's Director of the Environmental Cleanup Office made a final decision on the methodology and statistical approach for calculating background and directed the LWG to calculate background for 23 contaminants using the methodology. **[AR Doc # 500011627]** We understand the LWG may continue to disagree with the methodology, but that issue is no longer subject to dispute under the RI/FS AOC. Since the RI report calculated background for dioxins/furans as total PCDD/Fs and TEQ and EPA was using dioxin/furan congeners for the analysis in the 2016 FS (see 2016 FS Appendix B2), EPA calculated the background concentrations for the congeners of concern to: (1) develop PRGs, and (2) conduct the evaluation of the alternatives in the 2016 FS (see Appendix B of the 2016 FS). EPA used the same methodology to calculate background concentrations for dioxin/furan congeners of concern as was used in the RI and consistent with the EPA Director's final dispute decision.

Neither the RI nor the 2016 FS presented background concentrations for all COCs in sediment because the RI report concluded that there were insufficient detections to determine background concentrations for 2,3,7,8-TCDD eq, aldrin, dieldrin, DDT, Lindane, and TBT. The exception is TPH-diesel in which a background concentration was calculated in the RI Report, Appendix H, but was inadvertently omitted from Table 2.2-9 in the 2016 FS. The background concentration is 61 mg/kg, which would not change the selection of the PRG, which is 91 mg/kg, since the risk-based number is greater than background.

EPA did not present background concentrations for surface water in the 2016 FS since there was insufficient data to statistically compute a background concentration (i.e., there was only one year where 3 seasonal data points were collected). Further, since surface water PRGs are based on ARARs, EPA would need to waive the ARAR, which means that significant information would be needed to show that achieving the ARAR is technically impracticable.

LWG Dispute Issue 1h:

Sediment PRGs for RAO2 and RAO6 as well as riverbank PRGs for RAO9 for the five PCDD/Fs congeners are now all based on background concentrations. Background PCDD/F concentrations for individual congeners are presented in Appendix B, Table B2-4 of EPA's FS. The background values, however, are based on limited and poor quality data (with elevated detection limits) and involve taking the 95 UCL of detection limits for congener datasets based on all non-detects. In fact, only one congener has sufficient data (1,2,3,4,7,8-HxCDF) to calculate a background value and even that is limited (13 of 31 samples were non-detects). Thus, most of the background "values" are based on a 95% UCL of the detection limits rather than actual detections of contaminants. The background values are skewed quite low compared to those calculated for other urban watersheds and are of similar uncertain statistical validity.

EPA Position:

The LWG now states that its upstream dioxin data is limited and of poor quality, yet when it submitted its draft RI report it represented that the data was sufficient and submitted background values for EPA to approve. LWG presented background statistics for 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8-PeCDD, 2,3,4,7,8-PeCDF, 2,3,7,8-TDD, and 2,3,7,8-TCF in its 2011 draft RI report, essential using the same limited and poor quality data with elevated detection limits. Of these, the frequency of detection is greater than 50 percent for only 1,2,3,6,7,8-HxCDD, and is as low as 4 percent for 2,3,7,8-TCDF. Yet the LWG calculated a 95 percent upper predictive limit and a 95 percent upper confidence limit on the mean of the data for each dioxin/furan.

EPA determined that it was not appropriate to calculate upper confidence limits (UCLs) on the mean and upper predictive limits (UPLs) on data with such low frequency of detection, thus, background presented in the 2016 FS for these analytes was established as the 95th percentile of the detection limits. Because the background data set represented

"real life" data, EPA chose to establish background based on an upper limit of achievable detection limits.

LWG Dispute Issue 1i:
And while EPA's explanation of its development of its preferred Alternative I appropriately recognizes that Portland Harbor is a large and complex site where location-specific issues are important, EPA's June 2016 FS continues not to resolve a number of the LWG's prior questions about how EPA's alternatives contribute to meaningful risk reduction at the site consistent with CERCLA and the NCP:

EPA's calculation of PAH PRGs (and use of such PRGs for calculating post-construction risk) for minor or non-existent PAH fish consumption risk are not explained and not supported by the risk assessments.

EPA Position:
According to information presented in the final BHHRA, fish consumption risks solely from PAHs are 8 x 10^{-6} for tribal consumers (assuming a site-wide averaged concentration and a 175 g/day consumption rate) and 2 x 10^{-5} at RM 5 assuming a consumption rate of 49 g/day. While these do not approach the 1 x 10^{-2} site-wide risk estimates, EPA, unlike the LWG, does not consider these risk estimates "minor or non-existent."

The LWG has long maintained such risks are impossible, noting in the Bioaccumulation Modeling Report (2009 and 2015) that "fish metabolize PAHs." LWG further claims (p.163 of Attachment 1 to the dispute statement) that "The LWG has previously pointed out to EPA that there is no relationship between concentrations of BaP in sediment and vertebrate fish at the Site or anywhere else, given that it is well documented that fish metabolize PAHs to a greater extent than invertebrates, and that "fish have been shown to rapidly metabolize 99 percent of PAH compounds within 24 hours of uptake," thus "because fish metabolize PAH compounds so efficiently, fish tissue concentrations of PAH compounds have been deemed a poor means of assessing PAH exposure."

EPA disagrees that fish tissue concentrations are a poor means of assessing PAH exposure. In fact, direct measures of contaminant concentrations in the actual media to which receptors are directly exposed is an excellent means of assessing exposure. The LWG has repeatedly made these same claims based on selective citations of literature for several years in direct contradiction of the data the LWG itself collected and its own evaluation presented to EPA in the BHHRA. A simple literature search returned documentation that PAHs do in fact bioaccumulate in fish. For example, Rose et. al. (2012) concluded that "PAHs were found in fish of all ages therefore this result suggests that fishes are exposed to and accumulate PAHs from the early stage of their lives through different developmental stages up to maturity and that sources of PAHs are present and available to fish in Lagos Lagoon due to regular discharges from several sources."

LWG Dispute Issue 1j:
EPA's calculation of PAH PRGs for direct contact are not explained and are not supported by the risk assessments.

EPA Position:
PRGs for direct contact exposure (including PAHs) are clearly explained in 2016 FS Appendix B, Section B3.1.1. Because PAHs were evaluated only for carcinogenic effects for RAO 1, Equations B3-2 through 7 are relevant for calculating the PRGs. As noted, exposure values are summarized in Table B3-1, and unless otherwise noted, the source for each value is provided in Tables 3-21 through 3-25 in the BHHRA. As such, identical exposure assumptions were used when calculating the PRGs. The BHHRA evaluated risk due to exposure at specific, individual areas, and as noted in Section 3.5.8.6, a factor of 25 percent was used to account for the time spent fishing in a single area within the Site, which corresponds to a "site-use factor" of 4. While the application of site-use factor may be appropriate to assess the risk within a specific area, PRGs are intended to be applied to all beach and nearshore areas of the Site. Thus, if a receptor were to only be exposed to a single area, then a site-use factor would be appropriate, but when potential exposure at more than a single area is considered likely, use of a site-use factor is no longer protective. Due to the distribution of the contamination and the multiple uses and exposure points within the Site, EPA determined that it would not be protective to use a site-use factor.

LWG Dispute Issue 1k:
There continues to be an issue with EPA's modeled dioxin/furan tissue concentrations. In the BHHRA, the site-wide risk from the total TEQ based on the 95%UCL or maximum concentration for actual tissue data was 2 x 10-4. For Alternative A, the site-wide risk from 1,2,3,4,7,8-HxCDF alone based on an average concentration is 6 x 10-4. There is no way that the risk from an individual congener can be higher than the total TEQ, and EPA's methodology therefore drastically overestimates the risk in a way that cannot be supported scientifically. The FWM is used by EPA to back-calculate concentrations of chemicals of concern (COCs) in sediment associated with acceptable, risk-based human health and ecological concentrations in fish tissue as calculated using the baseline risk assessment. This influences sediment PRGs and hence RAOs, so uncertainty originating with the FWM cascades, having compounding effects on the evaluation of remedy alternatives, and could result in additional remediation costs with no meaningful gains in risk reduction. We identify the following shortcomings with EPA's application of the FWM at the Site:

A comprehensive and detailed Conceptual Site Model (CSM) for the Site in total, and for the relationship between COC sediment and fish tissue concentrations specifically, has not been presented by EPA. This means that EPA's chief assumptions for the FWM related to steady-state conditions (in a flowing water body), the completeness of the site characterization dataset, regional contributions of COCs, and the apparent relationship between sediment and fish concentrations cannot be collectively synthesized in terms of their overall coherence and veracity.

Based on an examination of the empirical data for the Site, no statistical relationship is observed between sediment and fish tissue concentrations for DDx and PCDD/Fs at the concentrations relevant to risk decision making. This means that the FWM - which assumes such a relationship exists – is not reliable and that the conclusions reached on its basis are fundamentally flawed.

Good modeling practice was not used by EPA for the FWM, and in particular sufficient model documentation detailing the work does not exist. Adequate model documentation is one of several criteria used by EPA and other international regulators for determining the acceptability of a model for regulatory decision making (USEPA 2009, EFSA, 2014, Grimm et al., 2014).21

EPA Position:
The calculated 95 percent UCL on the mean of the 27 individual 1,2,3,4,7,8-HxCDF SWACs shown in Appendix I of the 2016 FS is 0.26 µg/kg. Using the food web model the LWG calibrated for this COC, the estimated average tissue concentration is 0.046 µg/kg, which equates to a 6 x 10^{-4} risk, as shown in Table J2.3-1a of the 2016 FS. The discrepancy noted is likely due to limitations associated with extrapolating limited dioxin/furan sediment data site-wide, particularly when combined with the limited tissue data set. Respondents' assertion that the methodology is not "supported scientifically" represents a repudiation of the analytical tools they developed, and is otherwise simply a declarative statement unsupported by fact.

LWG Dispute Issue 1l:
The Food Web Model (FWM) used to calculate sediment PRGs from tissue PRGs was calibrated using PCB data. However, the model provided unachievable results for PCBs (zero listed in EPA FS Table 2.2-5 table). Predicting sediment PRGs using this model has even greater uncertainty for other compounds (e.g. DDx). This uncertainty effects the use of the model in the near field potentially more dramatically than at a site wide basis which is particularly evident where the sediment SWAC values are uncertain by an order of magnitude. Assessing model performance along the continuum of concentrations and scales of application (site-wide or near field) to assess the goodness of fit is necessary to evaluate whether model performance is acceptable, especially in areas of uncertainty in SWAC concentration at the low concentration range driving PRG derivations.

EPA Position:
Respondent's dispute position appears to contradict their own voluminous record submitted to EPA supporting the use of a food web model for PRG development. The LWG's initial evaluation **[AR Doc # 100004067]** stated:

The primary goal of food web modeling for the remedial investigation/feasibility study is to develop a predictive relationship between chemical concentrations in sediment, water, and tissue that can be used to derive preliminary sediment cleanup goals for chemicals that are present in fish tissue at concentrations associated with unacceptable risk.

LWG submitted a Draft Bioaccumulation Modeling Report to EPA in 2009, and again in 2015 with updated calibration for specific dioxin/furan congeners. **[AR Doc # 500012795 and 100003827]** In each submittal, the LWG stated:

With the Round 3 sampling program, which generated substantially more tissue and water chemistry data than were previously available, there are sufficient data to use the Arnot and Gobas model for other organochlorine pesticides besides DDTs. Using data from Rounds 1-3 sampling efforts, the Arnot and Gobas model was used for all organochlorine pesticide, PCB, and polychlorinated dibenzo-p-dioxin (PCDD)/polychlorinated dibenzofuran (PCDF) COCs.

In the LWG's April 23, 2015 responses to EPA's response to comments on Section 2 of the draft FS (submitted on p. 207 of respondent's Attachment to their dispute statement), they stated:

…the LWG agrees with the validity of the bioaccumulation model for use in calculating PRGs for the project (i.e., LWG is not challenging the accuracy of the model).

Further, the assumption of steady-state conditions is addressed in Appendix C of both the LWG 2009 and 2015 versions of the Bioaccumulation Modeling Report, which states:

Because of a lack of adequate time-dependent data for the Portland Harbor Study Area, the model has been simplified to assume steady-state conditions for the purposes of this application.

The LWG's Draft Bioaccumulation Modeling Report ultimately concludes:

Further, the mechanistic model can be used to estimate beyond the range of available data (e.g., to predict tissue COC concentrations lower than were found in collected fish samples). The Arnot and Gobas model explicitly accounts for the kinetics of chemical uptake and loss/dilution based on a mechanistic understanding of these processes. Because it is mechanistic, the model is appropriate for extrapolating beyond the empirically observed conditions in Portland Harbor, for example to project possible future conditions, to explore different assumptions about source terms (e.g., sediment versus lateral and upstream sources), or to calculate PRGs that fall outside the range of observed sediment concentrations. The fact that the Arnot and Gobas model is mechanistic also means that it can be calibrated to the data for a subset of chemicals and aquatic species and then "validated" with the data for other combinations of chemicals and species.

The mechanistic model was applied successfully for total PCBs, select dioxin/furan congeners, and pesticides including total DDx. For all chemicals, the model met or exceeded the stated objectives outlined in this document (i.e., SPAF < 3 for smallmouth bass and < 10 for other species). The calibrated model had SPAFs < 2 for smallmouth

bass for all modeled chemicals and generally < 5 for other species-chemical combinations (Section 5.4.1 and Section 6.3). Additionally, the model has been shown to perform well across a variety of chemical types (pesticides, PCBs, and dioxins), species (fish and invertebrates), KOWs, and spatial scales (Study Area-wide and smaller).

In conclusion, the bioaccumulation modeling presented in this report is suitable and reliable for calculating sediment PRGs for the Lower Willamette River.

EPA notified the LWG on November 18, 2014, that the food web model supplied to EPA in 2009 was approved. **[AR Doc # 100005458]** Thus, it is not clear why respondents' now claim that the food web model is not valid for calculating PRGs, when their 2012 Draft FS (Appendix Da, Attachment 1) states:

For the calculation of PRGs for sediment based on contaminant concentrations in tissue, the relationships between contaminant concentrations in sediment and tissue were evaluated using either the food web model (FWM) or through development of biota-sediment accumulation factors (BSAFs) or biota-sediment accumulation regressions.

Documentation of the Arnot and Gobas bioaccumulation model and its calibration, presented in Appendix B of the 2016 FS is adapted wholly from the report(s) submitted to EPA by the LWG. As noted, these submittals repeatedly assert that the food web model performs well for COCs other than PCBs (including DDx and specific dioxin/furan congeners), is suitable for calculating PRGs in sediment that are beyond the range of observed concentrations, and performs well at varying spatial scales. Absent a claim that information previously submitted to EPA in the numerous submittals referenced here were either erroneous or deliberately misleading, respondents provide no addition information that the food web model as developed by the LWG is not suitable to derive PRGs.

LWG Dispute Issue 1m:
Section 2.2.1 of the FS, under ARAR-based COCs, states "contaminants that were detected in upland media (storm water and groundwater) that may potentially migrate to the river at concentrations that would exceed the Safe Drinking Water Act MCLs and national or State of Oregon water quality criteria were also designated as ARAR-based COCs." This results in inclusion of PRGs for constituents not identified as a risk in the BHHRA. Further, it is inconsistent with EPA and DEQ rules to apply MCLs to porewater.22

EPA Position:
Regarding identification of COCs as a general matter, EPA considered comments received from the LWG and others on this issue in developing the 2016 FS and modified its approach, particularly, with identifying human health surface water COCs. After reviewing the quoted text in Section 2.2.1 and reviewing the referenced Tables, EPA understands why there is confusion about how COCs were identified. Some text in the

2016 FS in Section 2.2.1 and the referenced Tables did not get updated to account for the changes in approach used in the June 2016 FS.

All COCs for RAO 3 are risk-based. The risk is mainly due to exceedances of contaminants in fish tissue; except for chromium and MCPP where the risk was based on the drinking water pathway. The BHHRA risk for the drinking water pathway was based on exceedances of Regional Screening Levels. [See Amended Tables 2.2-2 and 2.2-3a and 3b attached to this dispute].

For RAO 3, the PRG for MCPP was based on the RSL value, which is consistent with the BHHRA. However, EPA selected the MCL for chromium as the PRG rather than the RSL for hexavalent chromium. All other PRG values are based on national or State of Oregon water quality criteria (MCLs were all greater values and were not selected). Because the food web model assumed that surface water meets water quality standards in deriving the needed reductions in sediment concentrations to achieve protective fish tissue concentrations [2016 FS Appendix B1], surface water for the contaminants in fish tissue needs to achieve water quality standards (which is the basis for the PRGs for RAO 3).

The COCs for RAO 4 are all based on the identification of COCs in groundwater plumes (see Section 1 of the 2016 FS) and are based on MCLs and EPA RSLs for tap water. EPA RSLs were only used when an MCL was not available for a specific contaminant. The quoted text from the "ARARs-based COCs" was incorrect in stating that upland storm water data that exceeded an MCL or State water quality standard was used to identify ARAR-based COCs. The text should read:

National or State of Oregon water quality criteria, MCLs, and EPA RSLs for tap water were used to establish PRGs for RAOs 3 and 4. These values are presented in Tables 2.2-6 and 2.2-7. RSLs are only used when MCLs or other ARARs are not available for a specific contaminant.

EPA disagrees with the LWG's long-standing position that exceedances of MCLs either in surface water or groundwater discharging to the river have no application to the Portland Harbor site. CERCLA Section 121(d) requires: (1) that any remedial action selected shall attain a degree of cleanup of hazardous substances, pollutants, and contaminants released into the environment and control of further releases at a minimum which assures the protection of human health and the environment; and (2) for any hazardous substance that will remain onsite, such remedial action shall require a level or standard of control which at least attains Maximum Contaminant Level Goals established under the SDWA, and water quality criteria established under Section 304 or 303 of the CWA. 42 U.S.C. Section 9621(d)(A)). The NCP provides that "[r]emediation goals shall establish acceptable exposure levels that are protective of human health and the environment and shall be developed by considering the following: [A] [ARARs] . . . [B] . . . [MCLGs] . . . . [E] Water quality criteria established under sections 303 and 304 of the Clean Water Act . . . ." 40 CFR Section 300.430(e)(2)((i)(A), (B), and (E).

CERCLA and the NCP are clear that MCLs are to be achieved in contaminated groundwater and surface water at a site when relevant and appropriate under the circumstances of the release. MCLs are relevant and appropriate under the circumstances of the release at Portland Harbor because the designated uses of the lower Willamette River include drinking water supply. (Designated Uses for the Willamette Basin specified for the Willamette Basin at OAR 340-041-340 and 340-041-0345.) Likewise, all groundwater of the state, including the groundwater adjacent to and under the lower Willamette River, are to be protected for the beneficial use of domestic drinking water supply. (OAR 340-040-0020(3)), which is as stringent or more stringent then the "EPA Guidelines for Ground-Water Classification" (December, 1986) (See 55 FR 8732, March 9, 1990). Releases of hazardous substances have occurred to groundwater that is discharging to or under the river within the Site or has the potential to discharge to the river which exceed applicable promulgated water quality standards and relevant and appropriate Safe Drinking Water Act standards for groundwater and surface water cleanup. Therefore, it was appropriate for EPA's 2016 FS to identify COCs and set PRGs based on MCLs for groundwater and surface water at the Portland Harbor Site. The LWG claims MCLs should not be applied to pore water. However, under the circumstances at this site, both groundwater and surface water are potential drinking water resources, and discharges of contaminants to the river represents one continuous pathway. Therefore, there is no basis to distinguish pore water from groundwater or surface water in regard to where compliance with the ARAR should be met.

LWG Dispute Issue 1n:

EPA continues to identify Regional Screening Levels (RSLs) as PRGs. For example, RAO 4 incorporates the tap water RSL for Manganese. That current manganese RSL is derived from outdated toxicity evaluation without clear adverse effects. A more recent and credible source of toxicity information (ATSDR 2012) concludes that an oral threshold value for manganese cannot be derived. Use of outdated and poorly supported toxicity criteria is inconsistent with EPA guidance.

EPA Position:

The RSL for manganese was calculated using the oral reference dose (RfD) developed by EPA's Office of Research and Development and posted in its Integrated Risk Information System (IRIS) database. Consistent with EPA guidance (EPA 2003), the toxicity values developed by the IRIS program represent Tier 1 values. This guidance states that "in general, if health assessment information is available in the Integrated Risk Information System for the contaminant under evaluation, risk assessors normally need not search further for additional sources of information." ATSDR minimal risk levels represent Tier 3 values in the recommended hierarchy. Further, respondents' assertion that the evaluation is "without clear adverse effects" mischaracterizes the information provided in both the IRIS and ATSDR assessments of oral and inhalation toxicity of manganese. While acknowledging that manganese is essential in the function of several enzymes, IRIS notes that "several disease states in humans have been associated with both deficiencies and excess intake of manganese." Epidemiological data evaluated "raises

significant concerns about possible adverse neurological effects at doses not far from the range of essentially." Thus, given its role as an essential nutrient and the ubiquitous nature of manganese intake in the general population, development of the RfD focuses on what is known to be a safe oral intake of manganese for the general population, which is consistent with the definition of the RfD. Further, while respondents note that ATSDR chose not to derive an oral MRL for manganese, they fail to note that it recommend use of an "interim guidance value" of 0.16 mg/kg-day to be used for ATSDR public health assessments of oral exposure to inorganic forms of manganese. The ATSDR recommendation is essentially the same as the 0.14 mg/kg-day RfD from IRIS.

LWG Dispute Issue 1o:
EPA's FS states, "Compliance with ARARs is determined by whether an alternative will meet all of the chemical-specific, action-specific, and location-specific ARARs and/or those that are to be considered (TBC) identified in Tables 2.1-1 through 2.1-3." Table 2.1-1 identifies EPA Regional Screening Levels for groundwater as TBC values. "TBCs are not ARARs … but may be considered and used as appropriate, where necessary to ensure protectiveness."

EPA Position:
The FS statement and the CERCLA Compliance with other Laws Manual are not inconsistent. A more complete quote from the CERCLA Compliance with Other Laws Manual indicates that chemical-specific TBCs can be surrogates for ARARs when needed to ensure protectiveness:

TBCs are not ARARs, but chemical-specific TBC values such as health advisories and reference doses will be used in the absence of ARARs or where ARARs are not sufficiently protective to develop cleanup goals (see discussion of risk assessment in Section 1.2.3.1 below). In addition, other TBC materials such as guidance or policy documents developed to implement regulations may be considered and used as appropriate, where necessary to ensure protectiveness.

It is not inconsistent with the NCP to evaluate whether remedial alternatives will achieve chemical-specific, numeric TBCs identified in the 2016 FS as PRGs. "Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs." [40 CFR 300.430(e)(9)(iii)(A)]. Nonetheless, only PRGs based on ARARs were the basis for EPA's determination in the 2016 FS that Alternatives B and D would not meet the second threshold criteria. The ARARs analysis of the alternatives was based on the mass balance analysis contained in Appendix K to the 2016 FS. The Appendix K analysis only looked at COCs that were in sediment and their effect on surface water using a mass balance approach. All of the PRGs for RAO 3 analyzed in Appendix K are based on national recommended ambient water quality criteria developed under the CWA or Oregon's water quality standards, no TBCs. MCPP (which is the only PRG for RAO 3 based on the RSL TBC) was not evaluated in Appendix K because there

are no sediment exceedances. Therefore, the determination that Alternative B and D would not meet all ARARs did not use TBCs.

LWG Dispute Issue 1p:
EPA establishes a PRG for total chromium; however, only hexavalent chromium was identified in the human health risk assessment as potentially posing unacceptable risk.

EPA Position:
Hexavalent chromium was identified as posing unacceptable risk via use of surface water as a drinking water source for both the RME and CTE evaluations. The risk assessment used the EPA RSL of 0.035 µg/L. Consistent with the NCP [40 CFR 300.430(e)(2)(i)(B) and (C)], the PRG for a drinking water source was set at the MCL, which is for chromium. The MCL for chromium is 100 µg/L. As stated in the 2016 FS, RSLs were only used where MCLs were not available. The risk management decision in the 2016 FS was that use of the MCL was sufficient to protect for risks from hexavalent chromium. It is noted that if a risk-based PRG for hexavalent chromium were derived it would be four orders of magnitude lower than the MCL.

LWG Dispute Issue 1q:
The RI and BLRAs do not provide information or a foundation for establishing cleanup goals or remedial actions for source control. The LWG has previously commented that EPA should not establish PRGs or RAOs for source control media that were not assessed in the BLRAs or RI.

The June 2016 FS uses a new rationale for including riverbanks in the FS. "Since river bank contaminations (sic) are directly linked to the sediment bed and receptors through proximity and source and migration pathways, the known areas of contamination are included here and elsewhere in the FS. Including these areas supports the evaluation of and selection of alternatives in case it is determined that river bank contamination is best suited for remediation in conjunction with in-river activities." This new rationale does not address the LWG's prior stated concerns.

The FS references an attached riverbank database, but the database was not included. Consequently, the Disputing Respondents continue to have no way to verify any of EPA's FS decisions regarding remediation of the river banks. Regardless, prior LWG issues with EPA's source control approach remain. These issues include that PRGs should not be established based on exposure pathways being evaluated in upland source control evaluations under DEQ oversight, and that none of these upland media were evaluated in the BLRAs or Remedial Investigation (RI). EPA's use of sediment PRGs for riverbanks, even on areas rarely inundated and without considering attenuation, is technically inappropriate. Delineations of groundwater plumes and riverbanks, and a zero post-construction restoration time frame are arbitrary. There is a total lack of data and analysis as to what risk considerations are driving the specific remedial actions delineated (and therefore how this will be refined in the design phase when further data/analysis is available) and what specific remedial actions will be implemented in

which areas driven by those risks. This arbitrary delineation is then carried forward into the evaluation of alternatives and given weight for assessing the relative effectiveness of alternatives. Further, the last-minute incorporation of riverbanks in the FS, when they have not been fully delineated, is counter to EPA policy and guidance.

In February 2001, a Memorandum of Understanding related to the Site was executed among EPA, Oregon DEQ and several state, federal and Tribal natural resource trustees. That MOU provided that EPA would be the lead agency for investigating and cleaning up contamination in the river sediment and DEQ, using state cleanup authority, was designated as the lead agency for identifying and controlling upland sources adjacent to or near the river. Pursuant to that MOU, the Portland Harbor Joint Source Control Strategy was finalized by EPA and DEQ in December 2005. Since that time, many owners and operators of facilities along the river, including several of the Disputing Respondents, have been actively involved with DEQ, planning and implementing source control measures. In the FS, EPA has ignored many of those fully or partially completed actions and identified groundwater and riverbank concerns that in some instances simply don't exist anymore, and in others are sites where property owners have agreed upon remedies to be implemented under DEQ oversight at or before the time of the in-water remedy. There is no reason for EPA to now both ignore and undermine those efforts by inserting RAO 9 into the FS, ignoring completely the DEQ Upland Source Control Update Summary Report most recently updated by DEQ in March 2016.

Several site-specific examples of errors arising from EPA's determination to select remedies for riverbanks without any foundation in the RI or risk assessments are set forth in the Appendix, attached and incorporated herein. To take a representative example, the FS does not account for upland work already performed by NW Natural at the Gasco facility pursuant to its DEQ Voluntary Agreement and in close coordination with EPA, the result of which leads to EPA to include presumptive excavation with presumptive cover material along the entire Gasco Sediments Site riverbank in all alternatives. This presumptive riverbank remedy is not supported by technical rationale, prevents meaningful comparison of the performance of technologies and limits the evaluation of multiple technologies that may perform equally effectively, is inconsistent with the range of technology assignments evaluated along different portions of the Gasco Sediments Site riverbank in the May 2012 Gasco Engineering Evaluation/Cost Analysis, and does not account for known impacts that will occur to existing upland structures and potential future upland source control structures. Similarly, The FS ignores that Gunderson has implemented permanent riverbank source control measures at some riverbank areas that are identified by EPA as needing remediation under the oversight of the Oregon DEQ and in accordance with the requirements set out in the DEQ-EPA Portland Harbor Joint Source Control Strategy. Gunderson has also completed interim source control measures under DEQ oversight at the remainder of the riverbank areas that are identified by EPA in the FS and agreed that additional permanent measures will be implemented concurrent with the adjacent in water remedy. And the FS ignores the riverbank remedial action implemented by Evraz at its Rivergate property, a remedial action based on a

source control decision made by the Oregon Department of Environmental Quality and concurred with by EPA.

EPA Position:
The LWG did not provide any legal or technical basis for its position that EPA should not address river banks as part of the in-river response action. The LWG argues the river banks are a different media that was not evaluated in the risk assessments, thus, EPA cannot or should not address them. Although soils may be a different "media" from sediment as a general matter, the LWG's argument ignores the site-specific facts at this Site. The baseline risk assessments determined there was unacceptable risk to human health and the environment from multiple contaminants found in surface water, sediment, groundwater and tissue. Many of those same contaminants, plus other contaminants that have been found to exceed ARARs in groundwater, are detected the river bank soils (both surface and subsurface) exceeding the PRGs for sediment, groundwater and/or surface water. The data gathered by ODEQ on the river banks is in the administrative record (See Appendix A to the 2016 FS). Maps 3.4-14a-h in the 2016 FS illustrates that the contamination in the river banks is immediately adjacent to and at most locations likely a mere extension of the contamination in the river. Currently the contamination in the river banks is uncontrolled and either is migrating or has the potential to migrate to the river. There are tidal fluctuations twice daily, submerging portions of the river bank throughout the day potentially exposing aquatic receptors to the river bank contamination. Furthermore, the river water levels rise and fall seasonally, thus, again submerging different portions of the river bank throughout the year. Other forces, sheet flow, gravity, or upland land uses, can lead to river bank soils eroding into the river. CERCLA and the NCP provide EPA with broad authority to take response action on releases or threatened releases of hazardous substances to the environment. The river banks as well as all upland sources are within the boundaries of the Portland Harbor Superfund Site. There is sufficient information and foundation in the 2016 FS and administrative record to support EPA taking action on river banks as part of the in-river portion of the site.

The 2001 MOU between EPA, ODEQ, Tribes and Federal and State Trustee agencies established the framework for roles and responsibilities for addressing the Portland Harbor Superfund Site. **[AR Doc # 1128679]** The MOU is an administrative tool and framework for coordination between all of the government agencies involve with the site. Section IV. A.1. of the MOU provides that DEQ is designated Lead Agency for the upland portion of the Site. EPA will be the Support Agency. The MOU further provided that "DEQ may elect for any reason to ask EPA to assume the Lead Agency role for any discrete facility(s) or portion(s) of the upland portion of the Site at any time." Furthermore, Section VII.D. states that: "The Parties recognize that each Party reserves all rights, powers, and remedies now or hereafter existing in law or in equity, by statute, treaty, or otherwise. Nothing in this Agreement is or shall be construed to be a waiver of the sovereignty of a signatory Party. This Agreement is intended solely for the purposes of facilitating inter-governmental cooperation between the Parties, and creates no rights in third parties or the right to judicial review." EPA retains all of its authorities to address any portion of the Portland Harbor site.

The inclusion of river banks was not last minute. In fact, DEQ requested we address some river banks as far back as 2012. **[AR Doc # 100013966 and 100013967]** Riverbanks were included in the 2015 version of the FS that the LWG was provided to comment on. The LWG was provided drafts of EPA's Section 1 of the FS, which identified river banks in early 2014. EPA identified contaminated river banks adjacent to in-river SMAs in coordination with ODEQ, who is the support agency for this Site and oversaw the collection of the river bank data. EPA sought ODEQ's input on the information presented in Section 1 of the 2016 FS. **[AR Doc # 100009725, 100009726, 100005299, 100005300, 100005518, 100005534 and 100005537]**

Furthermore, the SMAs are based on RALs, not PRGs, and were extended from in-river sediment to those river banks that were identified as contaminated since it is likely that those river banks are sources of the sediment contamination and are equally, and likely more, contaminated than the in-river sediment. The LWG provides no evidence contamination in river banks would significantly attenuate prior to exposure to in-river receptors or migration to the completely submerged portion of the river. To the contrary, known facts are that the contaminants being evaluated do not readily degrade and there is no deposition occurring on riverbanks or most SMAs adjacent to the riverbanks. Further, if there are concentrations in the river banks that exceed sediment PRGs, then they have the potential to erode and recontaminate the sediment. The delineation of groundwater, river banks, and sediment are all based on limited data and EPA agrees that refinement of these areas will need to be conducted in remedial design.

Source control actions are interim actions conducted under DEQ authority are not final CERCLA actions. EPA will evaluate the effectiveness of any source control actions conducted under DEQ authority with final remedy objectives and making the determination as to whether further action is warranted if significant risk of recontamination is found. Where early source control actions meet the requirements of the ROD, then EPA will not require further action to be taken in those areas. EPA cannot make such a determination in the FS, as it predates the ROD, but EPA did assume that all sources, other than river banks and groundwater plumes extending beyond an upland control measure, are controlled in the 2016 FS for purposes of determining what amount of sediment cleanup would be required to be protective of human health and the environment. Therefore, contaminated riverbanks that could recontaminate the in-river cleanup and upland groundwater plumes that are beyond the upland control point need to be addressed by the in-river remedy.

LWG Dispute Issue 1r:

The Feasibility Study is the appropriate point for EPA to bring in risk management principles. EPA's sediment guidance directs that cleanup objectives "should reflect objectives that are achievable from the site cleanup." The FS should therefore focus on those chemicals and cleanup levels that are technically practicable to be reached through a sediment remedy based on site-specific considerations.

Equilibrium. A sediment remedy must include evaluating what is deposited within the Study Area, both physically and chemically (i.e., potential future bedded sediment equilibrium). EPA has not conducted such an evaluation. The assumption that background sediment concentrations are the same as equilibrium is invalid. The cleanup goal for PCBs of 9 parts per billion (ppb) based on EPA's calculation of background concentrations is not achievable or sustainable by existing technology nor by nature itself. Experience gained at other sediment remediation projects conducted nationally and in Region 10 strongly argue that background should not be used to establish cleanup goals when likely ongoing contaminant inputs from upland sources within the Site and upriver of the Site exceed EPA's calculation of background. The LWG provided EPA an evaluation of equilibrium concentrations for the Site. Equilibrium is the only reliable indicator of future concentrations that can be achieved.

Perhaps the most important certainty at the Site is that the Lower Willamette River flows from south to north. As part of the flow, the river carries sediments which are deposited within the Site. Equilibrium is controlled in large part by concentrations of contaminants in the incoming sediments from upstream. This creates a bounding condition such that no amount of active remediation within the Site can achieve or sustain concentrations lower than that of the equilibrium level. Based on relevant empirical data collected by the LWG, no sediment remedy is likely to achieve PCBs lower than 20 ppb in the foreseeable future.

Realistic Exposures. As described in the Sediment Guidance: "A risk management process should be used to select a remedy designed to reduce the key human and ecological risks effectively." One of the fundamental flaws in the FS is the absence of any explicit, documented risk management. The term "risk management" is never used in the June 2016 FS or the Proposed Plan. Risk management in the Superfund program requires the consideration of the advantages and disadvantage of cleanup alternatives and balancing of trade-offs. This analysis includes an evaluation of the uncertainties at the Site, including uncertainties in the reliability of the exposure data used to identify the risks. One of the key factors in decision-making is: "[t]he likelihood of the exposure actually occurring should be considered when deciding the appropriate level of remediation, to the degree that this likelihood can be determined." At Portland Harbor, the risk assessments, particularly for human health, are built on a cascade of unrealistic and improbably conservative assumptions regarding exposure and durations. Unacceptable risks to various consumers of fish are based on questionable assumptions of how many resident fish people eat, from which areas of the river, how the fish are cooked, and for how many years any one person eats them. The assumptions are not placed in an overall estimate that is conservative but within a realistic range of exposure, as required by the NCP. EPA's description of this risk – people should eat no more than 6 fish meals every 10 years – is not well explained in terms of the exposure assumptions supporting the risk and those locations within the Site that actually pose an unacceptable risk for consumption of resident fish. Further, the assumptions are not comparable to assumptions used at other large sediment sites.

And, most important, EPA's June 2016 FS fails to document how the risk assumptions have been considered when evaluating alternatives. Nowhere in EPA's FS are the exposure assumptions with respect to risks from fish consumption expressly stated. Rather, the FS simply describes astronomical risks at the Site and the extraordinary measures needed to address such largely illusory risks. The absence of such information in EPA's FS demonstrates that an important element of risk management -- the reliability of the exposure assumptions -- has not been sufficiently considered.

Finally, the FS does not identify which areas of the Site currently pose the highest risk and should be prioritized for remediation. At a 10-mile Site that, according to EPA's FS, encompasses nearly 300 acres requiring active remediation and likely close to 20 years to perform, it would seem necessary and prudent to establish a basis for prioritizing and sequencing the cleanup of the higher risk areas. EPA's failure to do so shows that it is not effectively managing the actual risk.

EPA Position:

EPA guidance does not require an evaluation of equilibrium; however, EPA did evaluate equilibrium at post construction. EPA endorses the concept of equilibrium, however, the necessary information (sediment trend data) is not available to conduct an equilibrium evaluation in the long-term. EPA has developed background concentrations consistent with EPA policy and guidance. EPA has further looked at the sediment traps deployed in the upriver reach, which corroborate the values developed from the upriver sediment. The scatter plots of PCBs from the RI Report (Figure 5.2-1) shows that there are concentrations within the site that are already at or approaching the calculated background concentration of 9 µg/kg. EPA has been coordinating with DEQ on source control actions in the downtown reach and upland areas of the Site to ensure that sources will be sufficiently controlled that they will not recontaminate the Site. Therefore, there is no information available that indicates that background concentrations would not be achievable. Further, the lower Willamette River does not flow with certainty from south to north. There are several instances where the river flow reverses, which is an important aspect of the CSM and has been acknowledged by the Respondents (see LWG draft RI 2011, **AR Doc # 100006009**). The equilibrium evaluation conducted by LWG included sources that are being controlled under DEQ authority; thus, EPA deems that evaluation not relevant to current Site conditions.

Appropriate risk management was applied in the 2016 FS. The fact that there is no overt "risk management" section in the 2016 FS, or that EPA arrived at different conclusions than did the LWG in their 2012 draft FS, Appendix E (which was rejected by EPA), does not mean that such information was not considered in the development of the remedial alternatives in the 2016 FS, not the least of which was to assign MNR to the vast majority of the site in areas where contaminant concentrations – and thus the relative risk – are lower than within the SMAs.

EPA is well aware of the LWG's objections to the risk assessment, including assumptions regarding fish consumption, on which they previously invoked the formal dispute process

under the AOC. Respondents are referred to the final dispute decision for resolution regarding these issues. **[AR Doc # 715198 and 715199]** We do note the contradiction here with other sections of the LWG's FS dispute that argue that analyses presented in the 2016 FS need to be consistent with the approved risk assessments. But here respondents request that the approved risk assessments be discarded or simply ignored in the name of "risk management," Respondents' did in their draft 2012 FS, leading to their conclusion that "there is sufficient scientifically valid evidence that baseline conditions might already meet the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) threshold criterion for overall protection of human health and the environment." And while the purpose of the FS is not to once again recreate the risk assessments, exposure assumptions for all pathways are provided in Table B3-1 of the 2016 FS, areas of the Site that pose unacceptable risk (defined as sediment concentrations exceeding risk-based PRGs) are presented in Figure 2.2-2 of the 2016 FS. Finally, Section 3.4.1 of the 2016 FS defines SMAs as "areas with the most widespread contaminants that pose the highest risks," which are targeted for remediation through constructed remedial technologies.

LWG Dispute Issue 1s:

EPA does not explain its conclusion that Alternative B alone fails to comply with ARARs. Although EPA's August 2015 FS found that all alternatives met ARARs, this FS concludes that Alternative B would not meet certain water quality criteria. It is unclear how EPA reaches this conclusion only as to Alternative B, since EPA states elsewhere that it lacks information to evaluate the effectiveness of meeting these criteria for any of the alternatives under consideration.

Information in the RI demonstrates that surface water quality criteria for some COCs (e.g., PCBs and D/F) will never be met by any sediment cleanup at the Site because of upstream concentrations. EPA notes on page ES-17 of the FS, "It is expected that MNR in conjunction with ICs and source control, including control of upriver sources, is necessary to achieve surface water RAOs."

Similarly, MCLs are likely not achievable throughout the spatial extent of some groundwater plumes along the shoreline or out under the river, and achievement of such criteria are not necessary to design and implement groundwater and sediment remedies that are protective of all reasonable and likely future uses of groundwater. EPA should either determine that MCLs are not applicable, relevant or appropriate because MCLs do not apply to the groundwater in this context, or it should waive these water quality criteria ARARs now. MCLs are not applicable, relevant or appropriately applied to groundwater here because the Oregon statute designates the Lower Willamette River as a potential public and private water supply only following adequate pretreatment and because the federal Safe Drinking Water Act under which MCLs are developed designates that drinking water is appropriately sampled at the point of distribution.

EPA Position:

The 2016 FS Section 4.2.2.2, pp 4-20 to 4-21 states:

Exceedances of water quality criteria for protection of human health from contaminated sediment within the Site would continue for PCBs, cPAHs, and 2,3,7,8-TCDD eq at the completion of construction. There is insufficient surface water data to evaluate the effectiveness of this alternative in meeting the aquatic life water quality criteria for BEHP, PAHs and TBT. All other chemical specific ARARs are achieved with this alternative. Ethylbenzene from contaminated groundwater is expected to be addressed to achieve RAO 8 through implementation of source control measures. However, Alternative B only addresses 16 percent of the sediments impacted by groundwater. Alternative B, in conjunction with adequate upland and upriver source control measures, would not achieve numeric human health and aquatic life water quality criteria and drinking water MCLGs and MCLs. Long-term monitoring and maintenance of engineering controls, pore water, and surface water assist in evaluating the ability of this alternative to achieve chemical specific ARARs.

In conducting the analysis of achieving water quality ARARs from sediment remedial actions in the Site, EPA separated the upriver and downtown contributions of contaminants from the Site contribution of contaminants (see Appendix K and Figures 4.2-8a and f for PCB and dioxin/furan evaluation, respectively). EPA states in all alternatives (including Alternative B) that it lacks the information to conduct an analysis on smaller spatial scales and for RAO 7 PRGs. However, an analysis was conducted for RAO 3 PRGs on a site-wide scale. EPA's analysis shows that Alternative B does not sufficiently reduce the load of contamination from sediment to surface water such that water quality ARARs could be achieved.

See EPA position on LWG dispute issue 1g regarding background for surface water.

Please see EPA position on LWG dispute issue 1g for the legal bases and site-specific reasons why MCLs are relevant and appropriate to releases at this Site. There has been no information or analysis provided to the EPA to date that supports a waiver of MCLs at this site. It is EPA's expectation that DEQ's upland source control actions will adequately address groundwater contamination (the plumes). EPA's RAOs are focused on containing and reducing migration of COCs from groundwater to surface water and biologically active areas of sediment. Should groundwater not be addressed adequately under DEQ's actions, EPA may, at a future time, determine if action is warranted under CERCLA to further address groundwater contamination. [Section 2.2 of the 2016 FS] Likewise, if during remedy implementation it is discovered and demonstrated that achieving MCLs is not technical practicable a waiver of that ARAR may be found necessary. [Section 2.1.2 of the 2016 FS]

<u>LWG Dispute Issue 2</u>

EPA's June 2016 FS continues to lack complete and transparent evaluation of the long and short-term effectiveness and cost of its alternatives, as well as of the degree to which those alternatives reduce the toxicity, mobility or volume of hazardous substances through treatment, including treatment of PTW.

LWG Dispute Issue 2a:
EPA's inadequate conceptual site model does not provide a foundation for a thoughtful comparative evaluation of alternatives. The June 2016 FS does not sufficiently describe the relevant Site features, baseline risks, role of sources, fate and transport, and site uses and other important factors necessary to understand the potential cost effectiveness of various remedial technologies or EPA alternatives. Information on contaminant fate and extent is completely missing from the CSM discussion. In fact, the site has been characterized by EPA based on aggregated sediment data without regard to time dependent changes that reflect the kinetics of rate and extent operating in this system. It is not possible to accomplish a valid alternatives evaluation without an adequate operationalized theory and model of the site. The LWG previously commented that EPA's August 2015 draft FS needed a more balanced presentation of all sources in Section 1 (groundwater, riverbank, and stormwater). Again, this FS neglects to include a discussion of stormwater sources to the Site.

In the June 2016 FS, EPA added sites and edited the discussion of riverbanks and groundwater in Section 1. Based upon our preliminary review, the identification and presentation of these sites contains multiple errors set forth in the attached Appendix. For example, PCBs are listed as a riverbank contaminant at Arkema, but have only been detected in a small number of samples below the applicable screening levels (with one exception for a conservative bioaccumulative SLV). Further, the June 2016 FS neglects to include a discussion of upland source controls that have been implemented and the performance of those source controls in the remedial evaluations, such as the riverbank remedial action that has been completed at the Evraz Rivergate site under DEQ oversight and with EPA concurrence. The Time Oil groundwater plume identified in section 1.2.3.4 is fully controlled and meets JSCS values for all constituents other than potentially arsenic, which does not appear to be associated with site-related groundwater contamination.

EPA Position:
The conceptual site model is presented in the RI Report. The 2016 FS provides the relevant information required per EPA guidance [*Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (1988), *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (2005)]. The Respondents do not provide enough specificity as to the information absent regarding relevant Site features, baseline risks, fate and transport, and other Site uses. EPA describes contaminated media and the extent of contamination, but does not describe sources or source control in the 2016 FS Report. EPA provided a link to the DEQ source control report, which discusses in great detail the current status of source control and since that is not part of the action being taken, that level of detail did not need to be discussed in the 2016 FS. EPA's assumption in the 2016 FS was that all sources would be controlled. EPA used the information available to describe the fate and extent of the contamination in the Site.

EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (2005) recommends that modeling be conducted at large complex sediment sites, but does not require the use of a specific model. Further, the guidance states:

These modeling efforts typically require large quantities of site-specific data. Where numerical models are used, verification, calibration, and validation typically should be performed to yield a scientifically defensible modeling study.

and

…it is important that both calibration and validation be conducted at the space and time scales associated with the questions the model must answer.

The LWG in their 2012 draft FS states:

Appendix Ha (pp 26-27): "Because somewhat limited data were collected at the beginning of the model simulation period, and because the sediment data from that time did not fully characterize sediment levels uniformly throughout the site, the entire FS sediment dataset, which includes sediment data collected between 1997 and 2010 has been deemed representative of current conditions in the site."

Appendix Ha (p 46) that is say that "assessment of temporal changes in these data is difficult because this was not and objective of the historical sediment sampling programs … and as such, sediment data were generally examined qualitatively during model calibration."

Thus, Respondents themselves have acknowledged that the data necessary to develop a predictive model does not exists and that any model developed would have great uncertainty in predicting the outcomes of any alternative developed for the Site.

As stated above in EPA's response to LWG's issue 1q, early source control actions conducted under DEQ authority are not final CERCLA actions. The MOU puts DEQ in the lead and EPA has not approved the interim measures taken to date. Before beginning construction of the remedy, EPA will evaluate the effectiveness of source control actions conducted under DEQ authority with final cleanup objections to assess the likelihood of recontamination before taking in-river action. With respect to riverbanks identified in the ROD that are to be addressed, EPA anticipates that during remedial design that any early source control measures that have been taken will be evaluated to determine if further action under the ROD is warranted.

<u>LWG Dispute Issue 2b:</u>
EPA's alternatives evaluation is incomplete and almost entirely qualitative. EPA's June 2016 FS does not provide quantitative long-term effectiveness estimates, provides only very limited quantitative short-term effectiveness estimates, and attempts no cost-effectiveness evaluation.

EPA Position:
As discussed in the 2016 FS Section 4.1.5, long-term effectiveness and permanence refers to the expected residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time, once PRGs are achieved. Quantitative residual risk estimates are developed in the 2016 FS Appendix J Section J1 and presented in Table J1-1.

The evaluation of alternatives includes both quantitative and qualitative analysis of long-term and short-term effectiveness. The 2016 FS has provided quantitative estimates of residual risk for long-term effectiveness. The 2016 FS provides a quantitative evaluation of the remaining risks post-construction and qualitatively evaluates the time to achieve cleanup goals. The LWG provided no regulatory or guidance references that require a rigorous quantified analysis as they suggest EPA's FS should have done. EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (1988) states that the following factors are to be evaluated for short-term effectiveness:

Table 6-3. Short-Term Effectiveness

Analysis Factor	Basis for Evaluation During Detailed Analysis
Protection of community during remedial actions	! What are the risks to the community during remedial actions that must be addressed? ! How will the risks to the community be addressed and mitigated? ! What risks remain to the community that cannot be readily controlled?
Protection of workers during remedial actions	! What are the risks to the workers that must be addressed? ! What risks remain to the workers that cannot be readily controlled? ! How will the risks to the workers be addressed and mitigated?
Environmental impacts	! What environmental impacts are expected with the construction and implementation of the alternative? ! What are the available mitigation measures to be used and what is their reliability to minimize potential impacts? ! What are the impacts that cannot be avoided should the alternative be implemented?
Time until remedial response objectives are achieved	! How long until protection against the threats being addressed by the specific action is achieved? ! How long until any remaining site threats will be addressed? ! How long until remedial response objectives are achieved?

The guidance does not require the analysis be quantified. The quantitative and qualitative evaluations conducted in the 2016 FS are sufficient for an FS-level analysis.

A cost-effectiveness evaluation is not a requirement for a FS per the NCP and is not suggested in the RI/FS guidance. What is required and what was done is an individual and comparative analysis of the individual balancing criteria (long-term effectiveness and permanence, short-term effectiveness, and cost (in addition to reduction of T/M/V through treatment) that are ultimately used to make a cost-effectiveness determination. The cost-effectiveness determination is made as part of remedy identification and selection through the preferred remedy in the Proposed Plan and then the final remedy documented in the ROD (this is discussed in EPA's *The Role of Cost in the Superfund*

Remedy Selection process, EPA 540/F-96/018, Sept 1996). Thus, EPA was not remiss in not including a cost effectiveness evaluation in the 2016 FS.

EPA fails to explain its technical analyses, many of which appear to contain significant errors. Many of the new analyses EPA added to this FS appear to be technically incorrect and based on broad generalities, such as the surface water analysis approach included in Appendix K. This analysis appears to assume that surface water column concentrations will decrease by the same percentage as surface sediment SWACs, which ignores other inputs that will not change when sediments are remediated such as stormwater, groundwater, and upstream inputs.

EPA Position:
The surface water analysis approach included in Appendix K of the 2016 FS only evaluated contaminants in sediment that exceed ARARs in the water column. The analysis assumes that the surface water in the Site will decrease by the same percentage as the sediment SWACs. This analysis was only conducted on a Site-wide scale since there was insufficient data to conduct an analysis on a smaller scale. In order to account for the relationship between Site sediment and surface water concentrations, EPA subtracted out the contribution from upriver and downtown sources in the water column in conducting this analysis; thus, did not ignore other inputs to the Site. Since EPA further assumed in the 2016 FS that all upland sources to the river would be controlled, the only remaining input to the surface water is contaminated sediment. EPA disagrees that stormwater, groundwater and upstream inputs will not change since DEQ has been working with entities to control upland and upriver sources to the Site throughout the RI/FS process and will continue these efforts post-ROD.

Abbreviated short-term effectiveness evaluation. The June 2016 FS continues to inadequately address short-term effectiveness, particularly for an FS with alternatives that may require decades to complete. The FS makes no attempt to quantify impacts to the community, construction workers, and the environment except based on construction duration.

EPA Position:
See EPA Position to UPRR's dispute issue 5.

EPA's June 2016 FS does contain a limited evaluation of dredge release impacts. As the LWG has previously commented, guidance strongly recommends a comprehensive and quantitative evaluation of dredge release impacts. The June 2016 FS has a somewhat enhanced discussion of dredge residuals and releases, but no new quantitative evaluations were added. The June 2016 FS does not present a comprehensive and quantitative evaluation of dredging releases, the impacts on short-term effectiveness during dredging, and the associated increases in both human health and ecological risks. EPA continues to cite the findings of one project (Hudson River Phase 2) as the basis for its assumption that contaminant releases during dredging in Portland Harbor will be only 1% of the total contaminant mass dredged (as compared to the 3% recommended by

the LWG). EPA further uses this one project to support the concept that most of the releases greater than 1% can be eliminated by quickly covering dredge residuals, which is not fully supported. EPA implies elsewhere that residual covers should be applied on a daily basis, a requirement without precedent for a project of this scale. However, the impacts of such an approach on costs and duration of the alternatives are not quantified or further evaluated.

Issue 9. Dredge Releases Only Qualitatively Evaluated – EPA discusses dredge release issues in several paragraphs in Section 3 and evaluates them qualitatively in the Section 4, but neither Sections 3 nor 4 contain any quantitative assessment of potential dredge releases associated with the alternatives. Dredging releases are a well-recognized issue related to the short-term effectiveness of sediment removal that increases both human health and ecological risks. It is one of the main contributors to construction phase environmental impacts, particularly for alternatives that involve substantial dredging, such as those proposed by EPA. Per guidance (EPA 2005a), a comprehensive and quantitative evaluation of those impacts is required:
• "Generally, the project manager should assess all causes of resuspension and realistically predict likely contaminant releases during a dredging operation."
• "To the extent possible, the project manager should estimate total dredging losses on a site-specific basis and consider them in the comparison of alternatives during the feasibility study."
• "Dredging residuals have been underestimated at some sites, even when obvious complicating factors are not present."
• "Project managers should be aware that most engineering measures implemented to reduce resuspension also reduce dredging efficiency. Estimates of production rates, cost, and project time frame should take these measures into account."
• "The strategy for the project manager should be to minimize the resuspension levels generated by any specific dredge type, while also ensuring that the project can be implemented in a reasonable time frame."
The LWG disagrees with several aspects of EPA's limited analysis of dredge releases.
a. EPA uses limited qualitative evaluations of the range of release rates that can be expected for typical environmental dredging projects and the role of postresidual covers in reducing release rates. In a memorandum provided in 2013 (which are not cited in the revised FS) EPA relies on two recent projects (Lower Duwamish Boeing Plant 2 Early Action Area dredging and the Hudson River Phase 2 dredging) to support the contention that 1 percent overall releases are likely across Portland Harbor. The 1 percent release rate for the Boeing project is not supportable from the actual project data. EPA ignores the six case studies presented in Table 6.2-12 of the 2012 draft FS constructed from 2004 to 2009, all of which are based on detailed site specific data collection as summarized in the table. Thus, EPA is establishing a 1-percent release rate based on one project (Hudson River Phase 2) that appears to be one of the lowest release rates documented to date. Further, EPA is applying this optimistic release rate from a site that is entirely different both chemically and physically from the Portland Harbor Site, which includes 10 river miles of highly varying physical and chemical conditions. The 2012 draft FS provides summaries of six case studies from within the last 10 years with observed

average total release rates in the 3% range, and the LWG still believes this is a more realistic assumption for the revised FS. More details supporting the LWG's disagreements on this subject can be provided.
b. EPA describes on page 3-19 relatively detailed requirements for determining dredge completion and post-dredge sampling of the residuals, which in this particular case appears far too detailed for an FS-level discussion and does not appear to help determine the characteristics of the alternatives presented in Section 3. As described under Comment 1, EPA should leave such specific determinations to a performance-based ROD approach supported by a sitespecific engineering assessment in RD.

EPA Position:
EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (2005), Section 6.5.5 "Predicting and Minimizing Sediment Resuspension and Contaminant Release and Transport During Dredging" states:

Some contaminant release and transport during dredging is inevitable and should be factored into the alternatives evaluation and planned for in the remedy design. Releases can be minimized by choice of dredging equipment, dredging less area, and/or using certain operational procedures (e.g., slowing the dredge clamshell descent just before impact with the sediment bed).

The 2016 FS explicitly states that some contaminant release is inevitable in the alternative assembly and evaluation (see Sections 3.4.8.5, 3.4.8.6, 3.4.8.10). The discussion focuses on technological and operational procedures for lessening release and resuspension.

EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (2005), Section 6.5.5 "Predicting and Minimizing Sediment Resuspension and Contaminant Release and Transport During Dredging" further states:

To compare various remedies for a site, to the extent possible, the project manager should attempt to estimate the downstream mass transport and the degree of increase (if any) in downstream surface water and surface sediment contaminant concentrations. However, at present, no fully verified empirical or predictive tools are available to quantify the predicted releases accurately.

The 2016 FS release estimate emphasizes results from Phase 2 of the Hudson River dredging because it was a recent (2011-2015), large, multi-year dredge project, with site and operational characteristics similar to the dredging proposed in the feasibility study (contaminated sediment removal in a large, riverine environment with multiple mechanical dredges using barge transport). Hudson River Phase 2 dredging operations incorporated lessons learned from Phase 1 dredging and based recommendations from the Hudson River Peer Review Panel. Thus, the project represents state-of-the-art approaches for managing dredge releases while maintaining (or increasing) productivity. The Peer Review Report states, "The repeated dredge passes and prolonged exposure of sediments

in the certification units (CU) resulted in increased PCB resuspension and release." To minimize resuspension and release, the Panel recommended to improve depth of contamination estimating procedures and to:

"Establish BMPs to limit sediment resuspension and release.

Perform confirmation sampling in each 1-acre sub-CU as soon as possible after attainment of the DoC Elevation in 95 percent or more of the area is confirmed by EPA.

Place a 3-6 inch sand cover over sub-CU as soon as possible after confirmation samples are collected (before PCB analytical results are obtained).

Use PCB analytical results of composited surface samples to determine whether an area will be backfilled or capped and install final layers accordingly."

Per these recommendations, the 2016 FS also emphasizes BMPs to limit sediment resuspension and release and placement of residual sand cover to lessen releases.

Further, on September 10, 2013, EPA provided the LWG with a memo from USACE regarding dredge residuals. **[AR Doc ID # 500001131 and 500001132]** EPA used this analysis and the recommendations from USACE in developing the 2016 FS.

There is nothing in the 2016 FS on page 3-19 that discusses dredge residuals; thus, EPA is unclear as to the disputed issue raised by Respondents. EPA believes that the analysis conducted in the 2016 is appropriate level of analysis necessary for this Site. EPA does not have a "performance-based ROD approach" as purported by Respondents (See EPA's *A Guide To Preparing Superfund Proposed Plans, Records Of Decision, And Other Remedy Selection*
Decision Documents (OSWER 9200.1-23P).

EPA assumes that construction and use of sheet pile barrier walls as dredge water quality control measures based on the presence of NAPL in water depths less than 50 feet (see Appendix O) will support the short term effectiveness of all alternatives. The FS still fails to incorporate the time to install sheet pile walls in each alternative's duration or lower production dredging within the confined space and does not evaluate the cost effectiveness of sheet piles in general. The costs EPA uses ($2,750 per linear foot) would not be sufficient for water depths approaching 50 feet; these depths would require a much more expensive cofferdam type system. EPA also continues to show figures that depict sheet piling in greater than 50 feet of actual water depth, which is technically infeasible. (There continue to be mistakes in EPA's mapping of the appropriate water depths.) These figures also imply that sheet piles will be installed in the navigation channel, which would infeasibly obstruct vessel traffic. Sheet pile would also impact ongoing water dependent operations and nearshore fish migration. EPA does not consider the inability to remove contaminated material within the crenulations of the

containment barrier and does not evaluate whether sheet piles in the navigation channel could be permitted by USACE.

EPA Position:
Sheet piles are a representative engineered rigid control measure identified and evaluated for sediment dispersion control in the 2016 FS. However, that representative approach does not preclude other types of rigid control measures for consideration during remedial design. As stated in Appendix O, EPA agrees that depth can limit the use of suitable engineered options for controlling releases, and deep water depths can preclude the use of sheet piles. EPA assumes that engineered rigid containment will be utilized when NAPL was present in water depths less than 50 feet.

Engineered rigid control measures were evaluated holistically within the 2016 FS for their use in reducing or eliminating short-term releases of contaminants during construction and not on a location-specific basis. Thus, the 2016 FS does not present figures indicating design level logistical details regarding location and depth of engineered rigid control measures. Location-specific evaluations for feasibility of sheet pile versus other types of engineered rigid control measures, including placement within the navigation channel, were beyond the scope of evaluation of this 2016 FS. Details regarding sediment dispersion control and location-specific engineered rigid control measures will be determined during remedial design which is the appropriate time for those types of evaluations.

Alternative-specific costs for purchasing, installing and removing sheet pile walls are presented in Appendix G. The unit costs were developed by Anchor QEA in the draft 2012 FS on a horizontal linear foot basis. Quantities for sheet pile lengths used in the detailed alternative cost estimates and presented in the 2016 FS Appendix D Table D2.j (in horizontal linear feet) were holistically estimated for each alternative by encircling all PTW dredge and/or capped areas with silt curtains assumed for the remainder of dredged and/or capped areas.

Figure 3.4-33 of the 2016 FS presents areas of NAPL presence and Site bathymetry identifying water levels at the 50 feet MLLW. EPA acknowledges that the legend of Figure 3.4-33 should indicate that the darker shaded areas identify water depths greater than 50 feet MLLW, and the lighter shaded areas identify water depths less than 50 feet MLLW.

Remedial activities with the potential to restrict navigation in the harbor channel will be coordinated with the USACE during remedial design, including efforts to minimize sediment dispersion in areas where NAPL extends into the navigation channel. The Rivers and Harbors Act prohibits obstructions to navigation, but does not speak specifically to temporary obstructions, and CERCLA otherwise requires remedies to be protective of human health and the environment, and other federal statutes require measures to reduce impacts to ESA species or the aquatic environment as well. It was assumed in the 2016 FS that the review for compliance with the substantive requirements

of the relevant ARARs will occur during remedial design. However, permits and related administrative approvals, as implied by LWG, are not required for onsite CERCLA remedial actions and would not necessarily prevent implementation of these measures.

Long-term effectiveness evaluations are qualitative and not grounded in scientific method. Rather than quantitatively evaluating long-term effectiveness (all evaluations are based on a time zero SWAC), EPA has added a new approach of evaluating alternatives using "interim targets," which are basically ten times above the PRGs, and then EPA compares post-construction risks to these interim targets for evaluating the "overall protection of human health and the environment" for each alternative. EPA hypothesizes that if alternatives meet these interim targets, it is reasonable to assume the PRGs will be met through subsequent natural recovery in 30 years. It is confusing for EPA to claim they cannot quantitatively estimate MNR and then decide that MNR will work in 30 years. EPA also estimates "residual risk" as the estimated risk if all PRGs are met (i.e., risk at PRGs). EPA evaluated long-term effectiveness using a "magnitude of risk" defined per EPA page 4-10 as the ratio of the post construction risk to the residual risk. EPA does not explain why this analysis is technically superior to either the LWG's effectiveness evaluations or its own prior evaluations in the August 2015 FS. Alternative I does not meet some of these interim targets, yet EPA still picks this alternative as the preferred alternative which seems logically inconsistent. Figure 4.2-6 shows that none of the alternatives even come close to the ten times PRG levels. The same is true with Figure 4.2-4 (except Alternative G) and with Figure 4.2-2 (except Alternatives F and G). These methodologies fail to evaluate remedy effectiveness on appropriate spatial scales (fish consumption and ecological exposure), they fail to assess near shore deposition, and they fail to acknowledge the time frame and feasibility of achieving PRGs given upgradient concentrations and remedial action time frames. EPA in fact states that Alternative H "achieves PRGs at the end of construction," which is incorrect, because the very low PRGs for many COCs are not achievable through active construction.

EPA Position:

Long-term effectiveness evaluation is quantitative and grounded in scientific method. Long-term effectiveness risk remaining at the site after response objectives have been met. Thus, the remaining risks are the risks from any contamination remaining on-site after PRGs are achieved. Those risks include the risks at the PRGs and the risk of exposure of any contamination that is confined in the Site. In the evaluation of long-term effectiveness, the residual risk for each RAO is provided on various spatial scales relevant to the exposure scenarios established in the BRAs. The Respondents provide no supporting documentation as to why they believe the spatial scales are inconsistent with BRAs. EPA also provided the magnitude of the post-construction risk to show how much risk was addressed through construction and how much would be addressed through MNR. EPA did not use interim targets in evaluating long-term effectiveness; interim targets were only used for the discussion of overall protectiveness. EPA established the interim targets as levels of risk that would be acceptable should RGs not be achieved in a reasonable time frame (within 30 years) and are based on uncertainty in the risk estimates. Since long-term effectiveness is conducted after the PRGs have been achieved,

there is no need to evaluate near shore deposition or time-frames and feasibility to achieve PRGs. These are issues discussed in short-term effectiveness. EPA appreciates the opinion of the Respondents that PRGs for many COCs are not achievable through construction, but they have not provided any scientific evidence to support their opinion.

Respondents miss the point of using the interim metrics in the 2016 FS. In the absence of a predictive model for MNR, EPA had to have a way to compare the effectiveness of the alternatives. The interim measures were not meant as absolute measures, but the closer you were to achieving them, the more likely the use of MNR would achieve PRGs in a reasonable timeframe. Figure 4.2-6 of the 2016 FS presents post-construction infant HI. As stated in Section 4.1.2 of the 2016 FS, the interim metric was ten times residual HI of 132 (or 1,320), not ten times PRG levels. This interim metric is clearly achieved by all the alternatives. Respondent is correct in their assessment of Figures 4.2-4 and 4.2-2 and EPA came to the same conclusion in Section 4.3 of the 2016 FS. These three figures all represent RAO 2, which is the fish consumption pathway, and was conducted site-wide consistent with the BHHRA. These figure do not represent residual risk for other RAOs; those are found in other figures and tables presented in Section 4 of the 2016 FS.

It is not the place of the FS to discuss why a technical analysis conducted in one FS was superior or another analysis conducted was inferior. The FS provides the technical analysis selected by EPA, whether it was developed by LWG or by EPA. EPA could not use the LWG's analysis of effectiveness in their 2012 FS for the following reasons:

PRGs are not consistent with the final baseline risk assessments

PRGs were not developed for all COCs posing risk

The residual risk evaluation uses the QEAFATE model, which EPA cited many deficiencies and did not approve

The evaluation did not calculate risk, but only compared residual sediment concentrations to PRGs

Residual risk was not quantified

Background values used were inconsistent with the 2015 dispute decision.

EPA did not select a remedy in the FS; remedy selection is conducted first in the Proposed Plan and then considering public comments and finally documented in the ROD. Therefore, the basis of EPA selecting a remedy is not a subject of this dispute.

The Monitored Natural Recovery (MNR) evaluation is insufficient to support the alternatives evaluation. The FS continues to omit key components of an MNR evaluation as required by guidance including: 1) an adequate CSM; 2) appropriate evaluation of multiple lines of empirical evidence; and 3) a quantitative evaluation of natural recovery

and the associated long-term (i.e., after "time zero") outcomes of the alternatives. New concerns with the June 2016 FS include:

EPA added new information on bathymetry changes and fish tissue. In Section 3.6.1.3, EPA's updated evaluation of fish tissue concentrations over time completely ignores 2002 data without any explanation, and incorrectly evaluates data from 2007, 2011, and 2012. EPA should not combine temporally disparate data to establish baseline conditions.

EPA Position:
EPA guidance *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (USEPA 2005) Section 4.4 discusses the evaluation of MNR. The key components of an MNR evaluation that the LWG claims is required by guidance is not found in this guidance document. The information LWG claims is omitted from the 2016 FS is discussed below:

1) An adequate CSM. The assertion that there is an inadequate CSM is both subjective and confusing. The RI, over the course of thousands of pages develops and presents the CSM. The feasibility study conducts additional analyses of the RI and other data in the context of remedial alternative development and evaluation.
2) Appropriate evaluation of multiple lines of empirical evidence. A full evaluation of multiple lines of empirical evidence for natural recovery is provided in Appendix D.8 of the 2016 FS.

A quantitative evaluation of natural recovery and the associated long-term (i.e., after "time zero") outcomes of the alternatives. Outcomes greater than t=0 are not quantitatively evaluated using, for example, large, complex linked hydrodynamic, sediment transport, contaminant transport, and foodweb bioaccumulation modeling based on additional models of the effect of remediation because the results are not quantitatively accurate and absolute or relative comparisons among quantitatively inaccurate outcomes, is not helpful. Such evaluations are not "required by Guidance." However, quantitative evaluations of empirical data (trends in sediment deposition and fish tissue concentrations), where available, were undertaken. An evaluation of temporal trends (of any media) requires consistent collection methodology over the evaluated time period. The data also need to be able to indicate the processes that are being evaluated.

The 2002 fish tissue effort collected and composited individual fish from both sides of the river. The 2007 fish tissue effort composited samples from only one side of the river; thus, it is not appropriate to compare those data to the 2002 data. While the 2002 data may be relevant for risk assessment purposes (assuming a fisherman eats fish from both sides of the river), it obscures known site/source signatures that are on one side of the river. Evaluating trends of a group of fish collected and composited from both sides of the river is counter to the CSM and what is known about the localization and transport of contamination, so the 2002 data were not further used to evaluate changes in

contamination. The 2011 and 2012 samples were analyzed as individuals and are not biased by the compositing issue. EPA did not "combine temporally disparate data." EPA analyzed the data for 2007, 2011, and 2012 for changes over time to see whether a natural recovery trend in fish tissue concentrations could be discerned.

EPA states that, "a minimum deposition rate of 2.5 cm/year was assumed as the criteria [sic] for effective MNR." This criterion is obviously not used by EPA in the FS because the FS assumes MNR as the applicable technology for all areas outside SMAs (as opposed to applying MNR in just areas exceeding the minimum deposition rate). While deposition is a mechanism of natural recovery, there are other mechanisms occurring at this site. These mechanisms include biotic and abiotic transformations that remain unevaluated leaving the CSM incomplete. Further, the assumption of 2.5 cm/year as a criterion for natural recovery in the absence of a coherent CSM is without justification or merit. EPA has added some text that implies effectiveness is related to "mass removal" of contaminants. Page ES-15 states the advantage of Alternative H is that "it removes more contamination." Guidance is clear that mass removal is not an appropriate way to evaluate sediment remediation alternatives; rather the evaluation must address reduction in risk.

EPA Position:

EPA disagrees that the bathymetry data clearly show that net deposition occurs over large portions of the lower Willamette River during the overall multi-year period (2002 to 2009). In the LWG's 2012 draft FS, Section 2.1.2, p.2-3 states:

Over the period from July 2003 to January 2009, the Study Area was 88 percent depositional or showed no substantial change.

EPA disagrees that areas that areas that score neutral (no substantial change) are depositional since there is no accumulation of sediment in those areas of the Site. This line of evidence was used in the analysis of MNR in the 2016 FS (see Appendix D8), and the conclusion was that very little area of the site is depositional and the majority of the Site is neutral (transitional).

Regarding the statement "Therefore, a minimum deposition rate of 2.5 cm/year was assumed as the criteria for effective MNR.", the referenced text is in Section 3.6.1.2 "Sediment Deposition Rate," where the sediment deposition rate is positioned as one natural recovery line of evidence. The 2016 FS, Section 3.6.1, clearly states:

For the purposes of the FS, it is expected physical isolation through natural deposition of cleaner material and dispersion and mixing are the primary mechanisms for natural recovery at the Site.

Further, this criteria was not the only criteria used in the analysis in Appendix D8. Thus, the sentence in question should have stated:

Therefore a deposition rate of 2.5 cm/yr was used to indicate whether areas were depositional.

The 2016 FS (p. 134) describes mechanisms of natural recovery as: "Natural recovery typically uses ongoing, naturally occurring processes to contain, destroy, or reduce the bioavailability or toxicity of contaminants in sediment. These processes may include physical (sedimentation or dispersion), biological (biodegradation), and chemical (sorption and oxidation) mechanisms that act together to reduce the risks posed by contaminants." The CSM in the RI acknowledges that biological and chemical mechanisms occur in the Site as does the 2016 FS; thus, the CSM is complete. However, the LWG used literature values in the RI report (section 6) to discuss degradation rates. The LWG did not collect data to quantitatively evaluate these mechanisms.

The evaluation that included the 2.5 cm/year criterion was useful in further developing the CSM (which is described in the RI), concluding that:

The survey pairs range from generally erosional, to stable, to depositional between sequential survey pairs. This figure illustrates the dynamic nature of the sediment bed and the uncertainty associated with the conclusion that elevation changes between two surveys progressed evenly over time. This type of sediment bed behavior may also influence natural recovery: the process of burial would be interrupted during erosive periods, but dispersion would increase, if contaminated sediment was eroded…. This analysis indicates that most of the Site is in dynamic equilibrium where both erosion and deposition occur. In many areas of the Site, the determination of deposition and the assertion that burial is a viable long-term recovery mechanism is largely dependent on which survey pair is selected. (2016 FS p. 3-34)

The statement that "it removes more contamination" is not synonymous with the connotations regarding "mass removal." Remedial alternatives in the FS were developed based on contaminant exposures at the sediment surface that drive risk to receptors and the alternatives were compared and evaluated on the basis of risk metrics.

The 2016 FS addressed the issues the LWG raised in their LWG List of Significant Issues with EPA's Revised FS Sections 3 and 4 (September 8, 2015), Issue 8, pages 19-22. An analysis of MNR using multiple lines of evidence, many similar to those used by the LWG in their 2012 FS, is contained in Appendix D8 of the 2016 FS. The LWG did not provide specific concerns with Appendix D.

Further, EPA believes that the LWG's analysis of the fish tissue data is flawed. The LWG, with assistance from CAG representative Bill Egan and other local fishermen, collected small mouth bass tissue in the lower Willamette River in the fall of 2012. The data provide a snapshot of the current levels of PCBs in tissue in the Portland Harbor area and an area upstream of the Superfund Study Area. One of the objectives of the data collection was to help EPA establish a baseline in fish tissue that can be used for comparison with future monitoring results to see if levels or trends expected from the

cleanup of contaminated sediments can be achieved. Fish tissue data was also collected in 2002 and 2007.

EPA's observations of these data include:

PCB concentrations in bass tissue collected in Portland Harbor remain above those that would be considered protective for people eating these fish.

While some of the results indicate that PCB concentrations have decreased compared to 2007 data, fish caught in areas of Portland Harbor that showed the highest levels of contamination previously are still well above acceptable levels. The highest levels were from fish caught in the area known as RM 11E, one of the areas with the highest levels of sediment contamination. However, the inherent degree of variability in biota concentrations preclude drawing any firm conclusions based on the limited data.

Although it is premature to draw firm conclusions, decreases in some of the tissue levels compared to the 2007 data may be attributed to improving conditions from ongoing source control work, some natural recovery from cleaner material from upstream being deposited in sediments in the lower harbor, or simply variability in the data. Future monitoring will be needed to confirm whether levels will continue to trend downward.

Although it appears that some natural recovery is taking place, EPA believes that a combination of approaches, include active cleanup methods like dredging, capping, treatment, and other methods to enhance and accelerate natural recovery, will be needed to achieve significant risk reduction for people who are eating resident fish from Portland Harbor.

EPA agrees that the results of the 2012 fish sampling displayed a general trend of lower concentrations, with the notable exceptions of RM 9W and 11E. However, the 2007 data represent composites of 5 fish collected where they were most easily caught over a river mile, while the 2012 data represents individual fish caught from specific locations. The data are not directly comparable, and two somewhat similar sampling events aren't sufficient to establish a reliable trend.

Two fish collected from RM 16 contained noticeably greater PCB concentrations than other fish collected from the reference area. Sediment data collected at RM 16 during the LWG's background study revealed that PCB concentrations in sediment an order of magnitude greater than typical concentrations measured in the background data set, indicating the presence of a possible contaminant source or hot-spot. When data from the two fish with the highest PCB concentrations are excluded from the reference area data set, data from the site displays a trend of concentrations noticeably greater than background. The areas that display the highest PCB concentrations in fish tissue are consistent with the areas where the highest concentrations were observed in the 2002 and 2007 sampling efforts, and consistent with the trend that individual, discrete areas of Portland Harbor exhibit obvious PCB contamination.

Issue 8. Discussion and Analysis of Monitored Natural Recovery Is Biased – The MNR evaluation includes text scattered across Sections 3 and 4. The overall MNR evaluation presented across these two sections is very limited and technically inappropriate in many respects. Overall, EPA suggests that MNR is potentially appropriate for the Site with many caveats and doubts expressed in that assessment. In actual fact, the case for MNR at the Site is strong given that there are multiple lines of evidence supporting the ongoing occurrence of MNR well in excess of the lines of evidence presented by EPA. The simplistic MNR analysis in Sections 3 and 4, appears to cast doubt on the validity of MNR as a potentially feasible process for the Site, which is a misleading representation of the data.
In Section 3, EPA presents a very simplistic MNR analysis, which generally assumes that MNR will take place outside any active remediation areas based on: 1) surface to subsurface sediment concentration ratios; and 2) a simple deposition rate calculation using two of the time series bathymetry datasets. In Section 4, EPA slightly expands upon the evaluation of MNR, including a different analysis of the time series bathymetry, a brief discussion of maintenance dredging history as an indication of deposition, and a perfunctory discussion of the 2012 smallmouth fish tissue PCB data. Generally, it is unclear why there are two separate and somewhat conflicting MNR evaluations spread across these two sections, particularly given that neither section references the other. EPA's analysis does not include the full lines of evidence strongly supporting the presence of ongoing natural recovery at the Site. The LWG has provided this information in past submittals to EPA including the 2012 draft FS, a detailed presentation of smallmouth bass fish tissue concentrations (Anchor QEA 2013), and estimated equilibrium levels for the Site (LWG 2014d, 2014g).

EPA Position:
This comment pertained to EPA's 2015 draft FS, not the 2016 FS. In the 2016 FS, Section 3.6 discusses MNR and presents three lines of evidence for MNR: incoming sediment particles (sediment traps and suspended solids), sediment deposition rates (bathymetric pairs), and fish tissue concentrations (2007, 2011, and 2012 sampling events). Section 4 of the 2016 FS discusses that a fate and transport model cannot be used for this Site in Section 4.1.2 and states that the evaluation in Appendix D8 will be used to evaluate each alternative with respect to the ability for MNR to achieve cleanup goals in a reasonable time frame after construction activities are completed. Appendix D8 of the 2016 FS uses six lines of evidence to conduct this evaluation: (1) deposition and erosion rates; (2) consistence of deposition and erosion using bathymetric pairs; (3) sediment grain size; (4) anthropogenic factors; (5) surface to subsurface sediment concentration ratios; and (6) wind and wake generated waves.

In summary, the lines of evidence for ongoing natural recovery at the Site are:
• Sources are being progressively controlled. DEQ's latest source control report (DEQ 2014) indicates DEQ has completed source control evaluations and implemented (or will implement) controls on one or more potential pathways at approximately 119 of 168 sites examined in detail to date.

EPA Position:
While it is important that sources of contamination are controlled at the Site to ensure MNR will be effective, controlling sources is not a line of evidence that MNR is occurring in various areas of the Site.

• *The aggregate information from five multi-beam surveys indicates widespread deposition of sediments across many areas of the Site. Although EPA emphasizes the uncertainties of the data, for reasons detailed below, the LWG disagrees these data present substantial uncertainties about deposition.*

EPA Position:
See EPA's position on p. II-54.

• *Sediment trap and suspended sediment data clearly show that incoming settling sediment has substantially lower contaminant concentrations than most of the Site bedded sediment, which will drive bedded sediment concentrations lower over time.*

EPA Position:
EPA agrees and included this line of evidence in the 2016 FS, Section 3.6.1.1.

• *Radio-isotope coring data, although limited, indicates deposition rates consistent with other measures such as the bathymetry time series.*

EPA Position:
The LWG conducted radioisotope sampling on 4 cores to a depth of 90 cm and analyzed for ^{7}Be, ^{137}Cs, and ^{210}Pb. The results are presented in the *Draft Monitored Natural Recovery (MNR) Technical Memorandum – Step 2 Data Evaluation Methods* provided in Appendix A5 of the final RI Report. The report provides the following information:
The ^{7}Be activities were undetectable at every station except one and detectable concentrations were only in the upper 5 cm.

The ^{210}Pb profiles at the sampled stations did not show the exponential decay profile normally exhibited in a quiescent depositional environment. Evaluation of the data indicates that although no apparent decay trends exist for stations NA-3 and NA-4, stations NA-1 and NA-2 showed a general decay trend with depth. The downward trends in ^{210}Pb concentrations in two cores and the generally low ^{210}Pb concentrations in all cores suggest a much more dynamic sedimentation environment than assumed by simple application of the CRC or CIC models. Such profiles are indicative of sediment systems that have large amounts of gross sedimentation and gross resuspension.

Stations NA-2, 3, and 4 showed peak ^{137}Cs activities (0.13 to 0.37 pCi/g) within the top 5 cm of the cores and attained an approximate baseline activity at 0.05 pCi/g at deeper depths. Station NA-1 showed a consistent activity matching the baseline activity (0.05 pCi/g). In environments where the assumptions of the CRM and CIC Models are

accurate, these peaks are highly correlated with the peak in nuclear arms testing in 1963. Therefore, under these assumptions, the exposed surface sediment layer is indicative of the 1963 surface.

Based on this information, EPA disagrees that the radioisotope cores indicate any useful information regarding deposition rates.

• *Site surface sediment grain sizes are fine-grained across the majority of the Site, strongly indicating a long term depositional environment exists in these areas.*

EPA Position:
While EPA agrees that sediment grain size is a useful line of evidence and used that information in the 2016 FS, Appendix D8, EPA disagrees that only surface sediment grain size should be used and that the majority of the Site has fine grain size (see 2016 FS, Figure 2.2-1).

• *Surface to subsurface sediment concentration ratios in most areas of the Site indicate newer surface strata contain lower concentrations than older subsurface strata, which illustrates that surface sediment concentrations are decreasing over time.*

EPA Position:
EPA agrees and included this line of evidence in the 2016 FS, Appendix D8.

• *Surface sediment concentrations measured over time (i.e., time series) indicate surface sediments have decreasing contaminant concentrations. The 2012 draft FS data are somewhat limited, but new PCB data collected in 2014 by other parties may provide additional useful information for this line of evidence.*

EPA Position:
While EPA agrees that sediment time-series data would be useful in establishing MNR trends, no such data exists. The 2014 data that the Respondent refers to was not conducted in manner statistically comparable to the baseline data set and cannot be used to establish a trend. Further, many more years of information need to be collected to understand the MNR trends in sediment as they fluctuate from year-to-year. Further, the quality of the data collected in 2014 is questionable since it was not conducted under an EPA approved QAPP or work plan.

• *Smallmouth bass PCB tissue measurements made in 2002, 2007, and 2012 indicate statistically significant declines in tissue concentrations across almost all areas of the Site (Anchor QEA 2013). Differences in sampling and compositing schemes across the years can be controlled to determine statistically valid results.*

EPA Position:
While EPA agrees that the smallmouth bass PCB tissue concentrations from 2007, 2011 and 2012 indicate some information about MNR at the Site, there is insufficient data to

statistically compare this data. **[AR Doc # 100033469]** EPA does not believe that the 2002 data set can be compared to these other data sets (see EPA positions on p. II-52 and II-54 and EPA position to LSS Issue 5).

• *Comparisons of sediment profile images collected in 2001 (by the LWG) and 2013 (by other parties) indicate that much of the Site now has well established Stage 3 benthic communities indicative of stable and recovering substrates.*

EPA Position:
Stage III populations are late successional stage populations, meaning that the benthos has had some time to recolonize a disturbed area (or have not been disturbed), have the greatest number of species, and have species that burrow and feed as deep in the sediment as site conditions permit. Benthic populations in river miles 7.0 to 9.7 and 3.0 to 5.1 were mostly classified as Stage III populations in the 2002 SPI survey. The 2002 SPI survey did not include areas between RM 1.9 and RM 3.0 or between RM 9.7 and RM 11.8. Therefore, it would be hard to make a case that the health of benthic populations has substantially improved between 2002 and 2013, based solely on SPI data. The Respondent does not provide the comparison of the areas they believe have established Stage III populations where they did not exist before. Further, the 2013 SPI survey collected by other parties was not conducted under an EPA approved work plan or QAPP and EPA is concerned about representativeness of information.

• *Simple modeling (such as EPA's SEDCAM modeling, which was not provided in Section 3 or 4) and complex modeling (such as the 2012 draft FS QEA FATE model and coupled dynamic Food Web Model) all generally indicate recovery of surface sediments over a reasonable timeframe toward a relatively consistent range of potential equilibrium levels.*

EPA Position:
There are no models available to predict MNR for the Portland Harbor Site. As stated in the 2016 FS, Section 4.1.2, EPA reviewed the predictability of the 2012 draft FS QEA Fate Model and found its predictability poor. EPA also did not use the SEDCAM model as it only predicts deposition, not erosion, and is thus inconsistent with the conceptual site model.

Specific issues relevant to the EPA Section 3 and 4 MNR evaluations include:
a. In Section 3, EPA's MNR text starts by discussing that MNR is not usually selected as a "stand-alone" technology per guidance. Although this is consistent with guidance, neither the LWG nor EPA proposes to use MNR as a stand-alone remedy. The Section 3 text then goes on to list a series of cautions and conditions about MNR in bullet points, apparently intended to support the opening contention that MNR is not a good stand-alone remedy.
Further, some of the conditions noted in the bullet points as conducive to natural recovery are actually present or strongly indicated in Portland Harbor. Therefore, the purpose of this discussion in light of EPA's selection of MNR as a component of all

alternatives is unclear and should not be relied upon to undermine the substantial evidence supporting MNR as a major component of the overall remedy.

EPA Position:
This information is presented to inform the reader of the information needed to select MNR as a viable technology. EPA then goes on to discuss how Site-specific information was considered and MNR technology is viable at the Site. EPA disagrees that the information presented undermines the selection of MNR at the Site.

b. EPA's Section 3 discussion of surface to subsurface sediment chemical concentration ratios within the Site is misleading. For example, EPA uses a surface to subsurface ratio of 0.5 (which is more conservative) to indicate likely MNR, whereas the 2012 draft FS uses a ratio of 0.67. EPA does not discuss the rationale for the selection of this more conservative ratio, or why it leads to any more valid conclusions about natural recovery at the Site.

EPA Position:
The 2016 discusses surface to subsurface sediment concentration ratios in Appendix D8, not is Section 3. A subsurface-to-surface ratio of 2 and 10 were both used in the evaluation. The Respondent does not provide why they believe that using a ratio of 0.67 (or 1.5 subsurface-to-surface ratio) is more appropriate than the evaluation provided in the 2016 FS. At lower contaminant concentrations, it is very difficult to discern with any confidence the difference between a ratio of 1.5 or 2. For this reason, EPA added the evaluation using a ratio of 10. EPA did not use the LWG's ratio of 1.5. This number is based on site-wide averages of surface and subsurface data and then compared to obtain a ratio, which was 1.5. While this information provides a general depiction of the site as a whole, EPA was interested in whether MNR was viable in particular areas of the Site. A ratio of 1.5 is too small to discern whether or not MNR is working in areas with lower contaminant concentrations, which is where EPA intended to use the technology.

c. EPA's Section 3 discussion of deposition rates within the Site is misleading.
EPA appears to have ignored the LWG's comments in October 2014 where the LWG described differences in the definition of areas that are "reliably depositional." EPA continues to use the "typical bathymetric survey measurement error" of 6 inches or 15 cm (which equates to 2.5 cm per year (cm/yr) over the period of 2002 to 2009) to define areas that are reliably depositional. Measurement error in a bathymetric survey is a random error (i.e., there is no bias) with an average value of 0 cm for many measurements.
These data are normally distributed, so that a 15-cm measurement error is a very rare occurrence (e.g., at the 3-sigma level, which has a probability of occurrence of less than 1% for a single measurement). Thus, EPA's use of a +15-cm measurement error at a single location (10-foot grid) to specify the 2.5 cm/yr deposition threshold is extremely conservative. Further, evaluating and interpreting bed elevation changes on a 10-foot grid is not appropriate due to inherent measurement uncertainty at this small spatial scale. Averaging bathymetry data over larger spatial scales provides a more reliable

method for analyzing bed elevation changes because the effects of measurement error on the results decrease as the spatial scale increases. This approach was used by LWG in the 2012 draft FS to analyze bed elevation changes over a wide range of spatial scales in the Lower Willamette River.
The uncertainty in EPA's analysis results can be significantly reduced simply by averaging the bathymetry data over slightly larger spatial scales. For example:
i. Using a 20-foot grid (i.e., averaging of four data points from the 10-foot grid) would reduce the measurement uncertainty by a factor of 2 (i.e., +7.5 cm), which would reduce the deposition threshold to 1.25 cm/yr.
ii. Using a 30-foot grid (i.e., averaging of nine data points from the 10-foot grid) would reduce the measurement uncertainty by approximately a factor of 3 (i.e., +5 cm), which would reduce the deposition threshold to about 1 cm/yr.
Thus, using the data over appropriate spatial scales, it can be reliably determined that areas experiencing more than 7.5 cm of deposition over the 6-year period between 2003 and 2009 are depositional (equating to 1.25 cm/yr).
This difference between EPA and LWG's approach results in a large change in the amount of Site area characterized as reliably depositional (the LWG method results in 63%; the EPA method results in 47%).

EPA Position:
Appendix La of the 2012 Draft FS (p. 37) states that the typical survey measurement error range is 0.5 feet, resulting in an uncertainty range of 1 foot for bed elevation changes between two surveys. The uncertainty range in one direction (i.e., depositional) would be 6 inches, which equates to roughly 1 inch (2.5 cm) per year for the period between the 5/2003 and 1/2009 surveys. Therefore, the depositional criterion EPA is using assesses deposition that can reliably be detected using the available survey data. This information was provided to the LWG in a meeting on June 5, 2014, and again in an email on October 21, 2016. **[AR Doc # 100010336]**

There is an engineering "rule of thumb" that "When measurements add, their errors (uncertainty) add. When measurements multiply their relative errors add." In order to average a series of values, the values are first summed and then the sum is divided by the number of values. When there is error associated with the values, the error of the average value is derived using the same formula: the error associated with each value in the series is summed and then the sum of the error is divided by the number of values. The Respondents neglected to sum the error with each value and thus erroneously concluded that somehow averaging the area over larger footprints would lessen the error. However, averaging errors does not reduce the error in the measurement and, thus, the error is still the same for the average. Consequently, averaging over larger grids does not affect the uncertainty in the measurement.

d. In Section 4, EPA uses a different approach that biases results when evaluating temporal changes in bathymetry data between 2002 and 2009 and is inconsistent with recent Sediment Erosion and Deposition Assessment (SEDA) guidance (Hayter et al. 2014). EPA concluded that "many areas of the site are in dynamic equilibrium" and "for

many areas of the site, the determination of deposition, and the assertion that burial is a viable long-term recovery mechanism, is highly dependent on which survey pair is selected."
Generally, temporal changes in the Lower Willamette River (LWR) bathymetry (and similar river systems) are dynamic, with alternating periods of gross deposition and erosion occurring in localized areas. The bathymetry data clearly show that net deposition occurs over large portions of the LWR during the overall multi-year period (e.g., 2002 to 2009) examined as discussed in Comment 8c above. The net deposition process during a multiyear period does not typically correspond to steady continuous deposition; net deposition is due to a cumulative increase in bed elevation that results from alternating periods of deposition and erosion, with gross deposition being greater than gross erosion over a long period. This is not a surprising or unusual finding for this or similar river systems. Consequently, EPA's emphasis on comparisons between various individual pairs of bathymetry surveys ignores the overall trends represented by the bathymetry series as a whole. The FS is also misleading regarding the uncertainty of this information, given these dynamic sedimentation processes are routinely evaluated at sediment remediation sites using time series bathymetry data.
Such routine methods are used in the 2012 draft FS and are consistent with the most recent guidance (Hayter et al. 2014). EPA does not reference this guidance in the Section 3 or 4 bathymetry discussions.

EPA Position:
In the 2016 FS, Appendix D8, EPA uses the comparison between the January 2002 and January 2009 bathymetry surveys as one line of evidence for MNR and a comparison between each of the bathymetry surveys as another line of evidence. The first gives an overall understanding of deposition and erosion in the long-term. As stated by the Respondent, temporal changes in the Lower Willamette River (LWR) bathymetry (and similar river systems) are dynamic, with alternating periods of gross deposition and erosion. Thus, comparing all the bathymetric pairs provides information regarding where there is consistent deposition or erosion and where there is alternating deposition and erosion.

e. In Section 4, EPA devotes one paragraph to a discussion of the 2012 smallmouth bass tissue PCB data. EPA indicates that an "exact comparison" between 2002, 2007, and 2012 smallmouth bass tissue data is not possible because the "sampling and compositing schemes vary between years." The LWG provided a detailed presentation to EPA in March of 2013 comparing the tissue data across these years, including several types of statistical tests and other trend comparisons (Anchor QEA 2013). That LWG presentation showed that, in many respects, the differences in sampling and compositing across sample years can be controlled to obtain statistically meaningful information regarding clear declines in fish tissue PCB concentrations. EPA included in Section 4 the single most simplistic graph from the start of the LWG's presentation, which was intended to merely summarize the data that are available, not demonstrate observed declines. EPA concludes from this one misused graph that the data are only "suggestive of declines." The text ignores all of the other detailed information and graphs available that more

clearly show the tissue PCB declines, and EPA ignores all of the statistical analysis provided by the LWG. Consequently, EPA substantially understates the role of these data as a strong line of evidence for the effectiveness of MNR at the Site.

EPA Position:
See EPA Position on p. II-54.

LWG Dispute Issue 2c:
EPA's PTW approach is inconsistent with guidance and fails to result in reduction in toxicity, mobility or volume of hazardous substances commensurate with its extraordinary projected cost. As discussed in detail in the LWG's prior comments, EPA has designated as PTW large geographic areas with relatively low concentrations of contaminants of concern based primarily on its evaluation of the human health fish consumption criteria, which is an exposure pathway not based on highly toxic criteria and not typically used for PTW "highly toxic" designations. The conclusion that this exposure pathway should not be the basis for a PTW designation is corroborated by 2012 fish tissue data, previously shared with EPA, that show PCB concentrations in fish tissue have declined significantly resulting in human health risks that are likely to be lower than 10-3. The FS fails to satisfactorily explain how sediments in these large areas are highly mobile or highly toxic and cannot reliably be contained in place. For example, the FS does not explain or justify why sediment at the relatively low concentration of 200 ppb PCBs is "highly toxic," which is generally defined as a concentration several orders of magnitude above levels that allow for unrestricted use and unlimited exposure. At many other large sediment sites around the country, EPA's cleanup level for total PCBs is 1 part per million. The level requiring special disposal under TSCA is 50 ppm (50,000 ppb). Sediment at 200 ppb PCBs is well below what is considered an acceptable cleanup level at these other sites. And, as discussed above, EPA's recalculated site-wide PCB SWAC of 208 for Alternative A (No Action) used in Table J2.3-1a of Appendix J for the residual risk assessment exceeds this arbitrary PTW threshold, undermining the usefulness of the concept as a balancing criteria or otherwise.

The June 2016 FS includes new explanations that further show that EPA's PTW approach is inconsistent with guidance and flawed. For example, EPA states, "'Reliably contained' was not used in identifying PTW but rather was used to determine what concentrations of PTW could be reliably contained." This clearly contradicts the guidance, which discusses "reliably contained" as part of PTW identification.

EPA should not identify materials that can be reliably contained as "principal threat waste." EPA admits (in Table 3.2-2) that all COCs at the concentrations present in the site, with just two exceptions-- chlorobenzene and naphthalene, can be reliably contained. Thus, none of the areas where these contaminants are absent should be designated as PTW. Blanket identification of large areas of relatively low concentration sediments as PTW is neither required by the NCP nor necessary to protect public health or the environment.

Similarly, the June 2016 FS provides no discussion or explanation of how material with sediment concentrations above the EPA-identified "highly toxic" thresholds or the presence of "globules or blebs" of Non-Aqueous Phase Liquid (NAPL) pose risk of contaminant migration. Further, EPA's PTW-NRC footprint is mapped very differently in the FS and Proposed Plan, showing that, even at this late date, EPA has not spent adequate time evaluating this issue.

46 See, e.g., LWG List of Significant Issues with EPA's Revised FS Sections 3 and 4 (September 8, 2015), Issue 2 and page 8.

Issue 2 Principal Threat Waste – The LWG previously commented (LWG 2014c) that a precise identification and highly quantitative evaluation of PTW at the Site is not necessary or productive for completing the revised FS and is not necessary for EPA's selection of a remedial alternative. Per those past comments, EPA's proposed PTW approach is inconsistent with guidance on PTW (EPA 1991) in several respects. The LWG disagrees with EPA's logic and approach for determining PTW.
First, EPA uses fish consumption scenarios to determine "direct" cancer risk highly toxic thresholds in excess of 10-3. Before applying such thresholds for PTW identification, the presence of actual risks greater than 10-3 needs to be determined. In fact, greater than 10-3 risk was not found in the EPA-approved Baseline Human Health Risk Assessment (BHHRA) for dioxin/furan TEQ, total DDx, or BaPEq for any scenario evaluated.
Therefore, the definition of highly toxic as described by EPA (1991) is only potentially applicable to total PCBs. Second, as described in LWG's past PTW comments (LWG 2014c) greater than 10-3 cancer risk was found for PCBs in the BHHRA for three fish consumption scenarios: subsistence (mixed diet, fillet), recreational (mixed diet, fillet), and tribal (whole body and fillet). But EPA guidance (1991) describes PTW materials as a source for "direct exposure." The fish consumption pathways are, by definition, indirect pathways from sediment through fish to people, and these pathways do not represent "direct" exposures from sediment contaminants as described in the guidance. See the LWG's 2014 PTW comments for more details on this issue (LWG 2014c).
Third, the point-by-point application of EPA's highly toxic thresholds is entirely inconsistent with the spatial and temporal scales associated with this indirect exposure as described in the BHHRA. This includes that people catch fish over multiple areas and fishing events and that the fish range across different areas during those timeframes.
Fourth, EPA uses inapplicable and inferential evidence to identify potentially highly mobile (i.e., NAPL) material in a manner that is inconsistent with the intent of the PTW guidance. The highly mobile aspect of the PTW definition should be applied for NAPL consistent with situations described in the guidance (EPA 1991), such as "pools of NAPLs submerged beneath ground water or in fractured bedrock, NAPLs floating on ground water" or where physical processes are likely to mobilize "source materials" as defined in the guidance. EPA's identification of any potential NAPL as PTW is inappropriate and inconsistent with the guidance. For example, EPA identifies solid tar materials at Gasco as analogous to highly mobile liquids, which the guidance defines as "liquids and other highly mobile materials (e.g., solvents)." Also, at the Arkema Site,

continuous cores have been visually logged and hundreds of samples have been analyzed at the laboratory and, to date, no chlorobenzene NAPL has been found in Arkema sediments. EPA also uses any visual trace observations of NAPL, such as "blebs and globules," to identify highly mobile PTW. This approach is clearly inconsistent with the terms used in the guidance, such as "pools of NAPLs" as quoted above. See LWG 2014c for more description of how EPA's highly mobile PTW approach is inconsistent with the PTW guidance.

Also, EPA's PTW approach is inconsistent with the approach taken at other large river sediment remediation sites, including EPA's recent Region 10 ROD for the Lower Duwamish Waterway, where the maximum sediment PCB concentration was 220 mg/kg. Nonetheless, EPA determined the Duwamish sediments are generally "low-level threat waste" (EPA 2013). In comparison, at Portland Harbor, the maximum PCB concentration is 36 mg/kg, and EPA is identifying concentrations of 0.2 mg/kg as PTW. The LWG's PTW comments (LWG 2014c) review the PTW approach at five other large sediments sites, mostly with much higher contaminant levels than Portland Harbor. All of those sites also do not identify specific PTW areas in the FS process.

Additional specific issues related to the PTW text in Section 3 include:

a. EPA defines areas as PTW without including the reliably contained step of the evaluation described in the NCP and guidance (EPA 1991). Without the reliably contained evaluation included, these areas cannot be appropriately defined as PTW. In other words, only the areas that EPA designates as "not reliably contained PTW" have the potential to actually be defined as PTW.

See NCP Preamble, 55 FR 8666 at 8703 (March 8, 1990): "Principal threats are characterized as waste that cannot be reliably controlled in place, such as liquids, highly mobile materials (e.g., solvents), and high concentrations of toxic compounds (e.g., several orders of magnitude above levels that allow for unrestricted use and unlimited exposure)."

b. EPA's not reliably contained analysis using the so called "super cap" approach is also technically incorrect. EPA uses generalized Site-wide groundwater seepage rates for the super cap analysis rather than more localized estimates available in the RI. Further, groundwater control systems exist at both Gasco and Arkema sites, which EPA states were not considered in the analysis. For example, at the Gasco site, the groundwater source control system has been shown to cause negative seepage (i.e., movement of river water down into the sediment bed) over broad areas of the offshore sediments, but EPA's super cap analysis assumes that positive groundwater seepage out into the river is still occurring. Using appropriate seepage parameters where groundwater source control systems exist would result in no identification of not reliably contained material at the Gasco site. A similar analysis is appropriate for sediments offshore of the Arkema site, which has installed a slurry wall and a groundwater extraction and treatment system designed to prevent migration from the uplands to the river. EPA should consider the specifics of that groundwater control system, as well as other areas with significantly lower than average groundwater gradients (e.g., RM 2-4 East).

c. EPA's PTW approach results in large relatively low concentration areas of the Site being identified as PTW. For example, large PTW areas exist outside much of the SMA footprint of the smaller alternatives (e.g., Alternatives B and C), which is a unique

circumstance for a sediment FS as far as we are aware. Further, the concentrations that EPA is proposing as PTW would beconsidered completely safe under other common remedial and regulatory scenarios. For example, EPA's PTW level for PCBs of 200 µg/kg is below EPA's Regional Screening Levels (RSL) for residential soil, which range from 230 to 3900 µg/kg (per EPA's June 2015 RSL residential soil table carcinogenic risk values for total PCBs). DEQ's risk-based residential soil cleanup standard for PCBs is 200 µg/kg. Although EPA indicates that PTW is only a "preference" for treatment, EPA's decision trees indicate that PTW is almost always subject to treatment including reactive armored caps, reactive residual cover layers after PTW is removed, in situ treatment, or ex situ treatment after removal and before disposal. Regarding ex situ treatment, EPA determines that any PTW that is based on NAPL (including trace observations per above) and PTW related to cPAHs or DDx must be ex situ treated. Essentially, the only situation where removed PTW does not need to be ex situ treated is for high concentration materials above the PCBs and dioxin/furan PTW thresholds. EPA's PTW approach contributes substantial ex situ and in situ treatment components to both removal and in-place technologies for all alternatives both inside and outside of SMAs, as well as extensive sheetpiles (and associated costs) for removal in some areas. For example, Alternative B involves ex situ treatment of 240,840 to 321,120 cubic yards (cy) of sediment, which is about 39% of the total volume removed under this alternative.4 (Although EPA orally indicated on August 27 that much of this volume is due to RCRA hazardous waste determinations, this is not verifiable based on review of the information contained in EPA's cost appendix. See Comment 18 for more comments on RCRA hazardous waste determinations.) Per above, the PTW guidance does not support the need for treatment for all the materials falling within EPA's wide definition of PTW for this Site.

d. EPA is using extremely low dioxin/furan PRGs for PTW determinations that the LWG has previously commented are technically incorrect and not reflective of actual baseline risks (LWG 2014d, 2015a, 2015b). Also, as noted above for PCBs, EPA's dioxin and furan PTW levels are extremely low as compared to other common regulatory programs. For example, EPA's TCDD PTW level is 10 ng/kg in Table 3.2-1, while EPA's soil remedial goal for residential areas is 50 ng/kg.5

e. From a purely engineering perspective, it is not be necessary to conduct ex situ treatment of EPA-identified PTW before disposing of this material in a permitted landfill. The landfill acceptability criteria EPA discusses in Section 3 indicate that most of the PTW (as defined by EPA) would be reliably contained at the landfill without need for prior ex situ treatment (not just PCB and dioxin/furan PTW).

EPA Position:

The comment appears to be about both identification of PTW and the statutory requirement that remedies be cost effective.

Identification of PTW:

The NCP states that EPA expects to use treatment to address the principal threats posed by a site, whenever practicable" and "engineering controls, such as containment, for waste that poses a relatively low long-term threat." [40 CFR Section 300.430(a)(1)(iii).]

As noted in *A Guide to Principal Threat and Low- Level Threat Wastes* (Superfund Publication 9380.06FS, November 1991):

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. They include liquids and other highly mobile materials (e.g., solvents) or materials having high concentrations of toxic compound.

Therefore, principal threat wastes are either highly toxic **OR** they are highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.

Highly toxic principal threat waste at Portland Harbor was identified based on a 10^{-3} risk for an individual contaminant which is three orders of magnitude greater than EPA's point of departure for acceptable risk [see NCP 40 CFR Section 300.430(a)(1)(iii)] and with the Oregon State residual risk ARAR of 10^{-6} for individual contaminants and an order of magnitude greater than EPAs upper risk range for cumulative carcinogenic risks. Contaminants with concentration in the Site determined to be highly toxic include PCBs, cPAHs, DDx, and dioxins/furans (2,3,7,8-TCDD, 2,3,7,8-TCDF, 1,2,3,7,8-PeCDD, 2,3,4,7,8-PeCDF, and 1,2,3,4,6,7,8-HxCDF).

EPA disagrees with the Respondents that current Site risks, based on recent fish tissue samples it conducted, are likely less that 10^{-3}. That statement is speculative and not supported beyond the LWG's own interpretation of the fish tissue data, which is based solely on one fish species (smallmouth bass) and one contaminant (PCBs) and the selected fish species sampled was the third least contaminated species of all fish sampled during the RI. Whereas, the BHHRA evaluated risk from fish consumption based on four fish species.

Highly mobile principal threat waste at Portland Harbor was defined as NAPL that generally cannot be reliably contained **OR** would present a significant risk to human health or the environment should exposure occur. NAPL generally releases contaminants into the groundwater or surface water and cannot be reliably contained and poses significant risk to human health or the environment. EPA evaluated two sources of NAPL, MGP waste offshore of NW Natural and chlorobenzene offshore of Arkema. These NAPL sources release benzo(a)pyrene and napthalene (MGP waste), and DDT (Arkema) to groundwater and pore water. EPA clearly stated in the 2016 FS that the chlorobenzene dissolves the DDT and makes it bioavailable – the BERA concluded dissolved phase DDx in pore water (TZW) had an HQ of 210. Benzo(a)pyrene (a PAH) and DDT have been identified in the BERA as having contaminants of ecological significance and napthalene and chlorobenzene have HQs of 1,100 and 190, respectively. EPA conducted an evaluation of benzo(a)pyrene, napthalene, chlorobenzene, PCBs and DDT to determine if they were reliably contained. DDT (not comingled with

chlorobenzene) and PCBs were determined to be reliably containable at all concentrations. Benzo(a)pyrene at concentrations greater than 140,000 µg/kg, and napthalene and chlorobenzene at any concentration was determined to not be reliably containable. Therefore, the MGP waste and the chlorobenzene are both highly mobile principal threat waste. While modeling may potentially be an indicator of potential performance in some situations, it is not deterministic that the waste will actually be contained in the given situation.

"Reliably contained" alone was not used in identifying principal threat waste since that was not a requirement of the NCP nor EPA guidance *A Guide to Principal Threat and Low- Level Threat Wastes*. Further, there is no requirement that highly toxic source material be reliably contained. However, Highlight 3 in *A Guide to Principal Threat and Low- Level Threat Wastes* provides an example of mobile source material as:

Mobile source material - surface soil or subsurface soil containing high concentrations of contaminants of concern that are (or potentially are) mobile due to wind entrainment, volatilization (e.g., VOCs), surface runoff, or sub-surface transport.

EPA evaluated whether surface or subsurface sediment containing high concentrations of contaminants of concern are (or potentially are) mobile due to river currents, volatilization, wind/wake wave action or partitioning to pore water or surface water. In other words, any sediments with high concentrations of contaminants that are found in other media (surface water, pore water, biota) that are transported through various environmental mechanisms is a mobile source material. Consequently, the highly toxic principal threat wastes could also be deemed highly mobile source material. However, many of these contaminants (PCBs, DDT not comingled with chlorobenzene, and dioxins/furans) can be reliably contained (as discussed above) and thus were not identified as highly mobile source material.

EPA's evaluation of principal threat waste is consistent with the exposure assumptions at this Site. Highlight 2 in *A Guide to Principal Threat and Low- Level Threat Wastes* identifies contaminated sediment as source material, so the media of which is source material is the contaminated sediment. Further, on p.2 of EPA's *A Guide to Principal Threat and Low- Level Threat Wastes* it states:

Determinations as to whether a source material is a principal or low level threat waste should be based on the inherent toxicity as well as a consideration of the physica1 state of the material (e.g., liquid), the potential mobility of the wastes in the particular environmental setting, and the lability and degradation products of the material. However, this concept of principal and low level threat waste should not necessarily be equated with the risks posed by site contaminants via various exposure pathways. Although the characterization of some material as principal or low level threats takes into account toxicity (and is thus related to degree of risk posed assuming exposure occurs), characterizing a waste as a principal threat does not mean that the waste poses the primary risk at the site.

As an example of this, EPA's *A Guide to Principal Threat and Low- Level Threat Wastes* on p.2 provides:

For example, buried drums leaking solvents into ground water would be considered a principal threat waste, yet the primary risk at the site (assuming little or no direct contact threat) could be ingestion of contaminated ground water, which as discussed above is not considered to be a source material, and thus would not be categorized as a principal threat.

A similar scenario was used at Portland Harbor where the contaminated sediment are releasing contamination into surface water and biota is a principal threat waste even though the primary risk at the site (assuming little or no direct contact threat) is consumption of contaminated fish. EPA would argue that the contamination in the fish itself is not a principal threat waste (similar to groundwater in the example above), but the contamination in the sediment is akin to the leaking drum that is the source material.

Identification of PTW is site-specific based on risk from exposure at the Site. All principal threat waste decisions are site-specific. As stated in EPA's *A Guide to Principal Threat and Low- Level Threat Wastes*:

Although remedy selection decisions are ultimately site-specific determinations based on an analysis of remedial alternatives using the nine evaluation criteria, these expectations help to streamline and focus the remedial investigation/feasibility study (RI/FS) on appropriate waste management options.

Thus, EPA only used site-specific information to identify principal threat waste and determine waste disposal options (including treatment) at this site.

Identification of principal threat waste and source material is not based on a site-wide average since EPA is not designating the entire Site as containing principal threat waste. Consistent with EPA guidance, principal threat waste is high concentration areas of contamination. Those high concentration areas are identified as samples that exceed the threshold for principal threat waste. For highly toxic contaminants, those concentrations are provided in Table 3.2-1, and comprise 145 acres of the Site (less than 7 percent of the Site). The 2016 FS evaluation complied with the NCP expectation that treatment be used to address the principal threats posed by the Site, wherever practicable (40 CFR §300.430). However, based on the technology assignment process in the 2016 FS, if sediment classified as containing PTW was located in an area designated for capping, then there was an assumption that a reactive cap will be assumed for that area to meet the preference for treatment. The exact presence, location, and treatment requirements (ex-situ or in-situ) of principal threat waste will be determined in remedial design consistent with requirements in the ROD. EPA used the information currently available to base the cost evaluation for treatment of principal threat waste in the 2016 FS.

Furthermore, we strenuously disagree with the LWG's argument that any PCB contaminated sediment under 50 ppm should not be identified as highly toxic PTW because that is TSCA's regulatory threshold for disposal of electrical equipment or other PCB-containing materials. Such an argument inappropriately equates two different statutes, one primarily regulatory (TSCA) and one fully remedial. The LWG's view ignores the statutory mandate of CERCLA to select remedies for releases of or threats of releases of hazardous substances that present unacceptable risk to human health or the environment and the NCP's requirement to address principal threats at a site.

Cost Effectiveness:
The issue of cost effectiveness is tied directly to the CERCLA statutory requirement under Section 121(b) (1) that: "The President shall select a remedial action that is protective of human health and the environment, that is cost effective, and that utilizes permanent solutions and alternative treatment ... to the maximum extent practicable."

EPA did not select a remedy in the 2016 FS and therefore this statutory requirement is not applicable to the 2016 FS and is not subject to the dispute provisions in the AOC.

LWG Dispute Issue 2d:
Remediation waste management components of EPA's alternatives are difficult to understand, appear in many cases to be inappropriate or inconsistent with existing requirements, and seem likely to add significant cost without contributing any additional risk reduction benefit. EPA's June 2016 FS no longer includes the disposal decision tree found in the August 2015 FS. Although that decision tree contained multiple errors and inconsistencies, the absence of any such tool in the June 2016 FS makes it difficult to determine EPA's disposal assumptions for FS purposes (or the Proposed Plan). New EPA text in the June 2016 FS makes a few broad statements that could have major impacts on cost. For example, on Page 3-28, EPA notes that all detectable concentrations of pesticides removed from the site would need to follow Oregon Pesticide Rule procedures as interpreted by EPA. This has implications well beyond any areas highlighted by DDx RALs.49

EPA Position:
Section 3.4.9 of the 2016 FS discusses disposal management requirements and each alternative clearly discusses the disposal assumptions in the detailed evaluation of alternatives in Section 4 of the 2016 FS. Dredged material being disposed at an off-site landfill needs to be characterized and when required will be treated if a state or federal law requires it and/or the receiving facility requires it. If there is RCRA characteristic or listed hazardous waste contained in sediment, necessary treatment will be required. Additionally, dredged sediment containing MGP waste that exceeds TCLP criteria for MGP-related constituents and/or special considerations such as worker safety and equipment decontamination will need to be treated for disposal to be protective. **[AR Doc ID # 1198486]** Although not expected due to existing data, if there are dredged sediment that exceeds 50 ppm PCBs, disposal of such dredged sediment will need to comply with

TSCA's disposal requirements. At this time, no other dredged material is known to require treatment for off-site disposal.

Respondents did not provide specifics regarding what exactly about the waste management components was difficult for them to understand or what is inappropriate or inconsistent with existing requirements. EPA used the same methodology in developing disposal costs between the alternatives, the estimates are reasonable enough to compare alternatives. True costs will be determined at the time of disposal based on federal or state requirements and/or the requirements of the disposal facility.

LWG Dispute Issue 1e:
Confined Disposal Facility (CDF) acceptance criteria – As the LWG previously commented, EPA made some of the CDF acceptance criteria and performance standards more conservative (Table 3.4-7) since the T4 CDF 60% design, even though EPA references that design as the source of the criteria and standards. This situation has not changed for the June 2016 FS. No rationale is provided for why the changes make the remedy more protective or effective.

EPA Position:
Performance standards for the CDF are presented in Section 3.4.9.2 and Table 3.4-7 of the 2016 FS. The performance standards presented in Table 3.4-7 were taken directly from the CDF performance standards transmitted by EPA to the Lower Willamette Group (LWG) by letter dated February 18, 2010 and as subsequently presented in Table 5-1 of the Terminal 4 Confined Disposal Facility Design Analysis Report (Prefinal 60% Design Deliverable) **[AR Doc # 100007974]**.

Section 3.4.9.2 of the 2016 FS included additional requirements for material that may be disposed of in an on-site CDF. These acceptance criteria prohibit placement of sediment designated as RCRA or state hazardous waste, sediment designated as "Waste or Media containing Waste that May Warrant Additional Management", PTW that is highly mobile or cannot be reliably contained, sediment containing free oil or NAPL, or material without suitable geotechnical or geochemical properties. These acceptance criteria are consistent with EPA directed modifications to the CDF as a result of public comment as presented in the Action Memorandum for a Removal Action at the Port of Portland Terminal 4 site with the Portland Harbor Site. **[AR Doc # 1225662]**

1. Only sediments from the Portland Harbor Superfund Site are eligible for placement in the saturated zone of the CDF.
2. No sediments that may be designated as characteristic hazardous waste or contain free-phase oil would be eligible for placement without treatment to control potential for release and migration of these substances.
3. Sediments must be of acceptable geotechnical character (to be defined during design) such that they do not impact the long-term performance of the CDF.

Sediments must undergo appropriate testing including bulk chemistry tests and pancake column leachate test (PCLTs) to document source characteristics acceptable for the CDF. Maximum chemical concentrations measured in representative PCLTs of the sediments must be protective (to be defined during design) of surface water quality criteria.

LWG Dispute Issue 1f:

Cost estimates, volumes, production rates, and construction durations are inaccurate and lack transparency. The LWG previously commented on the August 2015 draft FS that EPA underestimated volumes and construction durations and used impossibly aggressive production rates and unattainable efficiencies given the required BMPs, complex disposal requirements, nearby residential community, and heavily used Willamette River. Due to these factors and other questionable costing approaches, the LWG commented that EPA's costs were substantially underestimated and consistently minimize the apparent costs of the larger alternatives and dredging, as compared to the smaller alternatives and capping. EPA's June 2016 FS cost estimates appear to exacerbate these problems, resulting in even lower overall costs for each alternative.

EPA Position:

A significant portion of this dispute issue appears to be centered on differences of professional opinion regarding the technical viability and implementability of remedial activities. The information provided in the cost estimate is based on the best available information regarding the anticipated scope of the remedial alternatives, and thus the issue at dispute is the technical assumptions and not the costs that they reflect. The stated purpose for FS cost estimates in EPA's *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* (p.1-2) is to compare remedial alternatives during the remedy selection process. The stated accuracy in this guidance for FS cost estimates at the detailed analysis phase is +50 to -30 percent of actual cost. The cost estimates were reviewed by EPA's National Remedy Review Board (NRRB). The NRRB reviewed the FS cost estimates in November 2015 and indicated that the costs presented were generally in the range of costs at other contaminated sediment Superfund Sites. **[AR Doc # 100001536]** The NRRB, while determining that the costs used were reasonable when compared to other contaminated sediment Superfund sites, did recommend further evaluation of specific assumptions and related costs. EPA reviewed comments pertaining to cost estimates and made changes to assumptions for all alternatives and updated the cost estimates, as appropriate, to better reflect the anticipated scope of a future remedy for the Portland Harbor Site as it became further defined between November 2015 and the 2016 FS. For instance, EPA reviewed assumptions pertaining to treatment of contaminated sediment for consistency with early actions and also reviewed unit costs for remedy components such as capping and dredging to reflect consistency with the productivity rates anticipated in EPA's evaluations. Reevaluations of these assumptions, specifically due to more refined development of the alternative's scopes, resulted in lower overall costs in the 2016 FS than as presented to the NRRB in November 2015. EPA's position is that the cost methodology and sources used in the 2016 FS meet the stated accuracy range.

Additionally, the detailed cost backup and individual cost summaries for each alternative presented in Appendix G meet the documentation guidelines presented in Chapter 6 of EPA's *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*.

See EPA's position to LWG's dispute issue 2f regarding dredge volumes.

A detailed construction schedule generally is not produced in an FS because the level of scope definition is too low to make those design-level determinations. However, a cursory evaluation of construction duration was performed for the major construction components (capping and dredging) as indicated in Appendix D.3. It should be noted that schedules indicate a minimum duration and that longer durations only affect present value cost as estimated. The productivity rates presented in a memo to LWG on August 14, 2015, from USACE was used to calculate construction durations **(AR Doc # 100011624 and 100033480)**.

The complexity of the disposal requirements is a factor of the material characteristics and is governed by regulatory considerations, which are presented Section 3.4.9.1 of the 2016 FS. EPA's position is that the complexity of the disposal requirements is appropriate for the expected material generated during remedial activities. The fact that LWG claims that the disposal requirements are too complex does not support the LWGs opinion that the cost estimates are substantially underestimated.

The cost estimate takes into account site specific difficulties expected with implementation. EPA developed project-specific unit costs using the Micro Computer Aided Cost Engineering System (MCACES) Second Generation (MII) software version 4.2, build 3. EPA's position is that the productivity rates along with the crew development used for development of site-specific unit costs are reasonable for an FS level evaluation and meet the stated accuracy range of EPA's *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*.

Missing cost elements:

EPA's cost estimate does not include the 3 to 5 year anticipated "initial conditions" assessment, subsequent pre-remedial design investigations, or additional riverbank sampling and remediation contemplated in the FS and Proposed Plan to be identified in conjunction with this post-ROD sampling. At the Head of the Hylebos project, which was primarily a PCB remediation involving roughly 44 acres, pre-remedial engineering investigation costs amounted to roughly 16% of remedy implementation costs.

EPA Position:

The remedial design percentage included as a percentage of the capital costs per EPA's *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* includes activities such as pre-design investigation and initial conditions assessment. As described in Section 5.5 of that guidance, engineering judgment may be used to adjust

rule-of-thumb percentages presented in Exhibit 5-8 for project management, remedial design, and construction management as well as the recommended range presented for technical support. As described in the 2016 FS, Appendix G, Attachment A, the percentages of professional and technical services costs are generally higher for projects of smaller scope and lower for projects of larger scope. The scope of the cleanup activities within the Portland Harbor Superfund site (thousands of acres) is much larger than the scope of the Head of the Hylebos project (tens of acres), and therefore it is expected that the percentage for remedial design costs used as a function of capital costs will be higher for the Head of Hylebos project and lower for the Portland Harbor Superfund Site.

The remedial design costs presented in the 2016 FS for each alternative were estimated to be comparable to remedial design costs estimated for alternatives evaluated in the Lower Duwamish Final FS, when reviewed on an annualized basis. The specific scope and costs for the "initial conditions assessment, subsequent pre-remedial design investigations, or additional riverbank sampling and remediation" will be identified during remedial design based on factors such as funding, phasing, and scheduling of work. Unknowns or unforeseen conditions for these activities and related costs not entirely captured in the remedial design percentage can be considered to be captured in the scope contingency applied to each alternative.

EPA does not appear to include any Oregon Department of State Lands (DSL) costs for access, leases and easements required for investigation, dredging, capping and monitoring activities. In documents the LWG obtained through its FOIA request to EPA, EPA's FS contractor acknowledged that these costs – which he characterized as "incredibly large" – were not included in the FS evaluations.50

50 See, DEQ/EPA Cost Notes (January 28, 2016) (R10-100007897), p. 11 (Attachment 4).

EPA Position:
Per EPA's *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, fees not otherwise covered by a direct line item are covered by a percentage of the capital and periodic costs in the professional/technical oversight named "project management." The EPA's *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* defines "direct costs" of cleanup as "the equipment, labor, and material costs necessary to construct the remedial action (including contractor markups, such as overhead and profit)."

EPA acknowledges that the Board of State Lands through the Department of State Lands promulgated rules for granting and renewal of access authorizations, leases, and easements issued to facilitate remediation conducted pursuant to an order issued by ODEQ or EPA and habitat restoration activities in, on, under or over state-owned submerged and submersible land. In general, section 104 of CERCLA, 42 U.S.C. Section 9604 provides the President with broad authority to take response actions to protect

human health and the environment where there is a release or potential threat of a release into the environment of hazardous substances (or pollutants and contaminants presenting an imminent and substantial endangerment to public health and welfare). In addition, subsection (e)(3) of Section 104 specifically provides the President authority to access **"[a]**ny vessel, facility, establishment, or other place or property where entry is needed to . . . effectuate a response action under" . . . CERCLA. Furthermore, Section 121(e)(1) of CERCLA provides **that: "[n]**o State, or local permit shall be required for the portion of any removal or remedial action conducted entirely onsite, where such remedial action is selected and carried out in compliance with . . ." CERCLA. The statute provides clear authority for EPA to take or require cleanup actions be taken, and explicitly states that no permit or license is required to perform a response action on-site. We also note that as a general matter, the United States is not required to pay state or local fees, unless Congress explicitly so requires. EPA anticipates that PRPs, including DSL, will perform the Portland Harbor cleanup and reasonable terms of access to private and state-owned property to implement the remedy likely will be the subject of future negotiation between the PRPs, landowners, and DSL; however, what those terms will be and what if any compensation is agreed to is too speculative at this time.

EPA's cost estimate does not include agency oversight and participation costs. These costs have represented more than 27% of RI/FS costs at Portland Harbor.

EPA Position:
Oversight costs are included as a percentage of the capital and periodic costs in the professional/technical oversight named "construction management" and "project management". See section 5.5 of EPA's *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study.*

EPA's cost estimate does not include the required 12-inch daily cover layer, which appears to be a new requirement to reduce dredging releases.

EPA Position:
The cost estimate in the 2016 FS, Appendix G, includes the 12-inch dredge residual layer in the volume of sand. The 2016 FS does not prescribe this as a daily cover.

EPA does not factor the need to acquire and develop transload facilities into the schedule.

EPA Position:
The 2016 FS does not provide construction schedules for alternatives, which is more appropriate during remedial design. However, cursory evaluations of construction durations were included for purposes of implementability and cost evaluations within Appendix D.3. The feasibility study assumes that the development of transload facility will be included in the initial year of preparatory activities. The assumption of preparatory activities occurring in the initial year is stated in the 2016 FS, Appendix D, Footnote K of Table D3-1 (Construction Duration Assumptions). The initial year of

preparatory activities would include pre-design investigations and start-up activities prior to beginning construction (in-water work). It is assumed that start-up activities would include development of transload facility, mobilization, setting up of staging area, preparation of the CDF (if applicable), etc. Expansion of the transload facility or additional transload facilities (if needed) was assumed to be developed concurrently during construction (in-water work) for FS purposes. Start-up activities will be addressed at the appropriate phase of the work, which is in the remedial design workplan.

Underestimated cost elements:

EPA continues to assume unattainable production rates and efficiencies assuming construction 24 hours per day for the basis of the project schedule and cost estimates. Stepping time is completely ignored. Furthermore, the need to operate in an active navigational channel will mandate the need to move the dredging equipment during each ship movement. According to the Columbia River Pilots Association there are 2 to 5 of such movements through this site daily. Each will represent a significant disruption and will result is significant loss of dredging and remedial project efficiency. The FS assumes that numerous requirements for innovative and complex dredge Best Management Practices (BMPs), precision dredging techniques, use of sheet pile barriers in some areas, and a transload and water treatment system (which will act as a bottleneck) will be performed simultaneously without incident or equipment breakdown, and with no additional time on costs.

We note that the Feasibility Study states that a fixed arm articulated bucket is the preferred dredging option where feasible and that a cable bucket will be used in water depths greater than 40 feet. This would correspond to the fixed arm bucket being used for roughly 80% of the dredge volume and cable bucket for 20%. However, the FS inconsistently assumes in the cost estimate and project schedule that the fixed arm bucket is used for 5% of the dredge volume. The cable bucket has a much higher production rate and lower unit cost than the fixed arm bucket. Correcting this assumption would increase alternative durations by 5 to 15 years, depending on 24- or 12-hour work days, respectively.

EPA continues to use aggressive dredging production rates. Sections 2.4.3 and 4.2.2.2 present a number of BMPs and controls to minimize impacts. These BMPs will slow dredging production and increase costs. The LWG's past production rates accounted for these anticipated BMPs which are likely needed to meet 404 water quality certification requirements but EPA's current rates do not.51 Some of these described BMPs and controls include:
- *Sheet piling in select areas*
- *Slowing the dredge cycle time to reduce bucket impacts at the bottom*
- *Rinsing the bucket to clean off excess sediment between loads*
- *Briefly stopping the bucket at the waterline to allow excess water to drain before raising bucket to barge*
- *Having precision cuts of only 50% bucket fills on last passes*

• *Pumping excess water from barges during dredging*
• *Placing a residuals cover daily*
• *Modifying the work schedule*
• *Performing work during low river flows*
• *Fish capture and removal inside work isolation areas*

EPA Position:
A memo was submitted to LWG on August 14, 2015 clarifying the development of the production rates based on an earlier review and recommendation by the Army Corps of Engineers (27-May-2013). **[AR Doc # 100011624]** The assumptions and calculations transmitted in the memo were included in Appendix D, Table D3-1 of the 2016 FS. In contrast to assertions made in the comment, stepping time, allowances for work disruption, and other impediments to dredging operations are accommodated in productivity rate estimates. USACE's 2008 *Technical Guidelines on Environmental Dredging* recommends the use of an Effective working time factor (p. 131): "Effective working time is the time during the dredging operations when actual production is taking place, such as material moving through the pipeline or being placed into a sediment barge. This is also referred to as "operating time." The Effective Work Time factor accommodates "when the dredge is operational but no production is taking place, such as time spent making changes to pipelines, cleaning debris from the suction head, changing sediment barges, moving the dredge, standing by for navigation traffic, making minor operating repairs, and refueling. This is also referred to as "allowable downtime." USACE's 2008 *Technical Guidelines on Environmental Dredging* (p. 93) states that the effective working time is "typically 55 to 70 percent for environmental dredging projects." The estimate used in the 2016 FS (62.5 percent) was the midpoint of that range. In this regard, dredge "operating time" is estimated to occur 15 of 24 hours, six days per week. The effective working time factor was explicitly used to the accommodate issues identified by the commenters as well as other unforeseen circumstances. As stated in the 2013 memo from Dr. Paul Schroeder, USACE ERDC **[AR Doc ID # 500001131]**, "A target production rate of 6000 cy/day, 6 days per week should be achievable even with the assumed efficiency impacts of resuspension control and residuals control and management if water quality, processing and disposal requirement can be met."

Regarding the estimate use of fixed arm vs. cable arm dredging, the 2016 FS, Appendix D, Table D3-1 states "Daily dredge production rates were developed assuming a 55/45 percent mix of cable arm versus articulated bucket dredges, based on the approximate areal percentages of navigation channel and maintenance dredge areas in the alternatives." It's acknowledged that the text in the main body of the feasibility study that is referenced by the commenters does not clearly state this basis (p. 3-22 of the 2016 FS states: "Cable-operated dredges are assumed for those Site conditions where fixed-arm dredges are not viable [such as water depths exceeding 40 feet] and will have no water depth limitations at the Site").

Overall, this and other comments on dredge production imply that overly high production rates falsely equate to shorter construction durations. Even if these FS-level production

rate estimates are high, other assumptions lessen the production rates. For example, the in-water construction duration is based on the assumption that "Cap and EMNR construction is assumed to occur in sequence (not in parallel) with dredging for estimating total construction" (2016 FS, Appendix D, Table D3-1). This means that all dredging would occur, then all capping would occur. This assumption is fine for its purpose (estimating a construction duration), but in practice, sequencing would not occur by technology type. Remedial action would be sequenced by area, generally moving from upstream to downstream, capping/dredging contaminated sediment, before moving on to the next area. It would not be reasonable to dredge a portion of an SDU and then return to that SDU two years later to begin capping the remainder of the contaminated sediment. As a result, estimated dredge volumes would be removed over the in-water construction duration, resulting in lesser production rates (e.g., Alternative I, has a 2.27 year estimate for dredging duration; 3.93 years of in-water construction, equating to a 42 percent lower annual production rate over the in-water duration). As a final point, because all alternatives have dredging to some degree, changes to the dredge productivity rates would have similar effects across all alternatives, and not significantly influence remedy selection.

EPA also has aggressive dredging rates for riverbank excavations. It is assuming dredging will be completed from the water with a 6.5 cubic yard (cy) bucket loading a telebelt that will transfer material to a haul barge. It is using an aggressive cycle time of 50 seconds for this work yet still implies use of the same BMPs as described above for sediment work.

EPA Position:

The 50 second cycle time quoted in the comment represents the "ideal cycle time" for riverbank excavation with barge mounted excavator. This does not take into account the 90 percent work efficiency factor and the 0.9 operator ability correction factor, which decreases the productivity. The information quotes in the comment from Appendix G of the 2016 FS was presented specifically for purposes of developing and checking the reasonableness of the presented unit costs (from the perspective of number of crews).

Having said that, the concern from the LWG about reduction of productivity due to use of BMPs is going to be location-dependent based on the type of contamination within the river adjacent to the riverbank and the sediment control BMPs used. Depending on the location-specific conditions, shoreline-based excavation of river banks may be desirable instead of water-based excavation to avoid the types of impediments suggested. Although for cost purposes riverbank excavation presented in Appendix G of the 2016 FS was developed assuming barge mounted excavator, the text of the 2016 FS presents the assumption that land-based excavators are assumed to be used for removal of contaminated river bank materials or near-shore sediment in locations above water levels. The actual approach used (land or water-based excavation) and related scope and costs for riverbank excavation are location-dependent and will be refined during remedial design. The assumption of water-based excavation for riverbanks does not impact the overall accuracy of the 2016 FS cost estimates.

EPA's water treatment plant consists of holding tanks and carbon treatment with no additional costs. EPA indicates that the water will be discharged back to the river. Based on past experience in Portland Harbor, this approach is unlikely to be acceptable. T4 dredging required water discharge to the City's POTW. EPA also assumed that water treatment will only be required during the days of dredging. All precipitation will need to be captured and treated, so the system will be required as long as there is dredged material on site.

EPA Position:
The water treatment costs presented in Appendix G of the 2016 FS, not only includes the costs of the components of water treatment (e.g. holding tanks, bag filters, and carbon adsorption on a skid mounted type system), but also includes crew costs for collecting water from dredging operations for treatment. For purposes of estimating costs, it is assumed that all necessary pretreatment (including dewatering) and handling of dredge materials will occur on the barge prior to arrival at a transload facility. There is no assumed stockpiling of material onsite nor at the transload facility, but that any water discharged from a stockpile area would be captured and treated. The cost estimates assume treatment of collected water on barges and discharge to the Willamette River after treatment.

The text of the 2016 FS indicates that wastewater will likely either require treatment prior to discharge to the lower Willamette River or disposal at a publicly owned treatment works (POTW) facility. While the 2016 FS necessarily assumes a representative set of water treatment process options for the general screening and alternative development procedures, this does not imply that other process options cannot be considered during remedial design. Use of a multi-stage filtration and granular activated carbon adsorption approach to water treatment is assumed as a holistic approach for all dredge material in the cost estimate. However, EPA acknowledges that an expanded treatment system may be required for some material, particularly PTW, on a location-specific basis. Unknowns or unforeseen conditions for these activities and related costs not entirely captured in the costs for water treatment can be considered to be captured in the scope contingency applied to each alternative. The scope and costs for wastewater treatment will be refined during remedial design on a location-specific basis.

Appendix F indicates that Subtitle C material will be hauled to Boardman and then hauled by truck to ChemWaste, similar to what was done for the Gasco Early Action. However, the cost estimate only has 1 day of haul time to Boardman and 18 hours return. The cost estimate assumes that the material would be stockpiled on site at the Boardman transload facility and then loaded into trucks. The Boardman site, used previously for the Gasco Early Action, has only 4 to 9 acres of available space, with the high end of the range assuming that the current operations are terminated to allow for the transloading. This will not be sufficient for the anticipated Subtitle C material EPA plans to remove. For Gasco, the material was loaded directly from the barge to the trucks. The Gasco Early Action processed only approximately 15,000 cy of material, while Portland Harbor

will have an orders-of-magnitude-more volume, which will overwhelm the Boardman facility. EPA received a quote from ChemWaste to truck the material from Portland Harbor to their facility as an alternative. However, this would entail 10,555 truck trips of Subtitle C material through Portland neighborhoods.

EPA Position:

The 2016 FS looks at modes of transport and associated transload of wastes from a macro perspective, but the primary assumption in the 2016 FS was to use barges for the purposes of implementability and cost evaluation. The 2016 FS also indicated that multiple modes of transport could be used and could be evaluated during remedial design phase of the project.

EPA talked with the representative facilities including ChemWaste, Port of Morrow (Boardman site) and the barging company (Tidewater Transportation & Terminals) and they did not indicate any significant concerns about logistics of transload of NRC/NAPL PTW waste volumes for transport and disposal at ChemWaste. It should be noted that Tidewater Transportation & Terminals was the barging company used for Gasco Early Action. Also, through discussions with the representative facilities, the cycle time in terms of barging and trucking reflects their cycle time input for a round trip. Based on these discussions and inputs following cycle time for barging was assumed in the FS cost estimates: 1 day of barge time to Port of Morrow (Boardman site) and 18 hours of barge time for return.

The 2016 FS cost estimate does not assume that the barged material would be stockpiled at the Port of Morrow (Boardman site) transload facility. Instead the 2016 FS cost estimate assumes direct loading in two steps; using a crane to offload from barge and a front-end loader to load the trucks. In addition, an offsite transload facility development cost was included to account for additional flexibility in transload. In terms of flexibility, as indicated in Appendix F of the 2016 FS, multiple modes of transport besides barging (rail or truck) could be used to transport waste to ChemWaste from transload locations as determined during remedial design. It should be noted that ChemWaste had indicated for budgetary purposes for the feasibility study that the cost of transport wouldn’t differ significantly between the various modes of transport once transload was taken into account.

The ChemWaste landfill is assumed to only be used for disposal of NRC/ NAPL PTW. As compared to Gasco Early Action (~15,000 CY), the Portland Harbor Superfund Site remedial action will generate a large volume of waste material for disposal at ChemWaste (~285,000 CY); however this volume is assumed to be generated over a longer construction duration of 5 seasons as assumed for Alternative I. Based on these assumptions it is estimated that approximately 2,400 CY per week (which is approximately 1 to 2 barges per week) would be handled at the transload facility for disposal at ChemWaste. As mentioned above, the barging company, the transload facility, and disposal facility did not indicate any significant concerns about logistics of handling the required volume for transportation, transload and disposal.

The cost estimate appears to assume the Subtitle D material is barged to Bingen and then hauled by truck to the Roosevelt Landfill. There is no analysis of whether the Bingen offloading facility could accommodate 6,200 cy per day of dredged material for processing. EPA is also assuming that diatomaceous earth is added into the sediments to absorb the free water, but they do not account for the $9M in added tonnage for disposal.

EPA Position:
The assumption in the 2016 FS for contaminated sediment disposed of at a Subtitle D facility is that it is barged to Bingen and hauled by truck to Roosevelt Landfill. EPA did have a discussion with Roosevelt Landfill facility about their ability to transload material from barge and they indicated the ability to accommodate the quantity that the project may develop, specifically including their ability to handle 6,200 cy/day of dredged material. They also indicated that there are sufficient options available since Roosevelt Landfill facility has agreements with a number of transload facility locations along the Columbia River including potential plans to build a new transload facility irrespective of this project (see 2016 FS Appendix G, Cost Estimate Backup Project- Specific Vendor Quotes).

LWG is incorrect that diatomaceous earth was not accounted for in the disposal costs. As described in the 2016 FS, Appendix D [D2.4 Treatment and Disposal Quantities, D2.16 Truck, Rail, Barge Loads for Disposal Volumes (DMM Scenario 1 - Confined Disposal Facility and Off-Site Disposal), and D2.17 Truck, Rail, Barge Loads for Disposal Volumes (DMM Scenario 2 - Off-Site Disposal)], the volume or tonnage of diatomaceous earth required for pre-treatment was considered and included in overall volumes and tonnages for transportation and disposal. These quantities were presented in the tables referenced in the 2016 FS, Appendix D2.4, D2.16, and D2.17, and were subsequently used in the cost worksheets for the alternative cost estimates within Appendix G. Also, the 2016 FS, Table D2.d, shows the calculations that illustrates the inclusion of diatomaceous earth for all dredged sediment (except those destined for CDF disposal under DMM Scenario 1).

EPA does not provide any details on project schedule related to integration of dredging, daily covers, and caps. Capping materials alone include more than 800,000 cy. Two capping plants working 12 hours per day would be needed to place roughly 200,000 cy per season per LWG estimates; EPA's estimated rates are 600,000 cy per season from two plants with one working 24 hours per day and one working 12 hours per day.

EPA Position:
LWG is incorrect that EPA does not provide any details regarding schedule related to integration of dredging and capping. The feasibility study does not provide construction schedules for alternatives, which is more appropriate during remedial design. However, cursory evaluations of construction durations were included for purposes of implementability and cost evaluations within Appendix D.3 of the 2016 FS. These evaluations were primarily based on the major construction components driving overall

durations (specifically capping, dredging, and in situ treatment) using the USACE-determined productivities as indicated in Appendix D.3 of the 2016 FS. This table explicitly documents the methodology used to arrive at the construction durations with respect to capping and dredging.

LWG is also incorrect regarding EPA's assumptions of the number of capping plants and their productivities. EPA assumed three plants, not two, operating 6 days per week with one day of maintenance per week. The estimated productivity of each of these plants is 1,500 CY per day (4,500 cy per day total) but that placement rate was reduced in the construction duration estimates to 3,900 CY per day for all three plants to account for a weekly average. These assumptions are stated in the 2016 FS, Appendix D, Assumption No. 4 in Table D3-1 (Construction Duration Assumptions).

EPA continues to use a very simplistic approach to estimating dredge volumes, which has a large potential to substantially underestimate the dredge volumes eventually determined in remedial design.

EPA Position:
EPA disagrees that a simplistic approach was used to estimate dredge volumes in the 2016 FS. EPA developed dredge volumes using "neat" line volumes based on interpolated area and depth data. To take into account side slope stability (dredge prism), neat volumes were multiplied by a factor of 1.5 to estimate the Low Volume with Overdredge, and by a factor of 2.0 to estimate the High Volume with Overdredge. Total volumes for each alternative were calculated as the average of the estimated low and high overdredge volumes. This is consistent with information presented in the Corps Technical Guidelines for Environmental Dredging of Contaminated Sediments (Palermo et. al., September 2008) – Section 3.4.3:

"For FS level considerations, an adjustment factor of 50 percent (i.e., an estimated dredge prism volume equal to 1.5 times the neat line prism volume) is appropriate for typical site conditions."

Guidance states that the ratio of dredge prism (including allowable overdraft) to the neat line prism (which is what EPA assumed in the 2016 FS) can be as high as 3 based on work at the U.S. Navy Homeporting project in Everett, Washington. However, it seems that the estimate of dredge prism to neat line ratio of 1.5 – 2.0 is reasonable for Portland Harbor and consistent with the guidance for an FS level evaluation. During remedial design, dredge prisms will be developed that minimize the amount of material that will need to be removed through dredging.

EPA uses the same 7% discount rate as used in the EPA 2015 draft FS, which heavily discounts the larger alternatives (i.e., Alternative E is discounted a total of 41% and Alternative G is discounted by 77%). This discount rate is indicated on the first page of EPA's 2000 cost estimate guidance for FSs. However, the second complete paragraph on Page 4-5 of that guidance indicates that a different discount rate can be used as long as

it is justified consistent with OMB Circular A-94. Accordingly, the LWG's 2012 draft FS used a discount rate of 2.3%, consistent with guidance as explained in that document. The equivalent treasury rate for 2016 is 1.5%, which is a much more appropriate discount rate at a site where the PRPs include the United States, the State of Oregon, municipalities, public utilities, and many parties whose principal or only source of funding for cleanup are insurance funds outside their investment control. It is also the rate that EPA would presumably use in calculating required financial assurance.52

52 2016 Discount Rates for OMB Circular No. A-94, M-16-05 (Office of Management and Budget, February 12, 2016)

EPA Position:

As discussed in EPA's *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (EPA 540-R-00-002), the real discount (interest) rate used for present value analysis in the FS depends on whether the site is classified as a Federal facility site. Federal facility sites are former or current installations operated or controlled by a Federal government agency and identified by EPA's Federal Facilities Restoration and Reuse Office (FFRRO). The Portland Harbor Superfund Site is not a Federal facility identified within FFRRO's site inventory. In addition, the guidance specifically mentions that although a Federal-lead site cleaned up by EPA using the Superfund trust fund (Fund-lead sites) may be an analogous situation to a Federal facility site being cleaned up using Superfund authority, there is always a chance that a potentially responsible party (PRP) could remediate the site. Thus, per guidance a real discount rate of 7 percent should be used in calculating present value costs for all non-Federal facility sites such as the Portland Harbor Superfund Site. This expectation is documented in the last paragraph of Page 4-5 of the guidance.

EPA's *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* in the second paragraph on page 4-5 also specifically states that any changes to EPA's policy to use a 7 percent discount will be reflected in an update to OSWER Directive 9355.3-20. EPA has not updated that directive, and thus use of a 7 percent real discount rate is still the expectation per that directive. Furthermore, while the statement that a differing discount rate can be considered based on a change to the discount rate within OMB Circular A-94 is correct, OMB has not changed from a 7 percent real discount rate (see Paragraph 8(b)(1) of OMB Circular A-94). Updates to discount rate in Appendix C of OMB Circular A-94 are not considered changes to the policy (see second paragraph on Page 4-5 of EPA 540-R-00-002 and related Footnote 3).

LWG also asserts that a differing discount rate should be used to be consistent with financial assurance practices used for these types of sites that use funding from PRPs. As indicated on Page 2-3 of EPA's *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study*:

As a project moves from the planning stage into the design and implementation stage, the level of project definition increases, thus allowing for a more accurate cost estimate. An

"early" estimate of the project's life cycle costs is made during the FS to make a remedy selection decision.

At the FS stage, the design for the remedial action project is still conceptual, not detailed, and the cost estimate is considered to be "order-of-magnitude." The cost engineer must make assumptions about the detailed design in order to prepare the cost estimate. As a project progresses, the design becomes more complete and the cost estimate becomes more "definitive," thus increasing the accuracy of the cost estimate. This process is depicted in Exhibit 2-3 for remedial action projects in the Superfund program.

Further, EPA's *Guidance on Financial Assurance in Superfund Settlement Agreements and Unilateral Administrative Orders* (p. 5) states:

2. Considerations for applying a discount rate for FA

A discount rate is the interest rate used in calculating the present value of expected future costs.[16] As noted in existing EPA guidance for documenting cost estimates during the FS, the Agency generally uses a 7% real discount rate to compare alternatives during the remedy selection process.[17] The goal of that guidance was to improve consistency, completeness, and accuracy of cost estimates developed specifically during the feasibility study phase of the Superfund remedy selection process, but not to offer guidance on determining an FA amount.

FA requirements are generally designed to ensure that sufficient funds are available for the government or another party to complete cleanup work if a PRP does not perform the required work. The Agency believes that FA based on a 7% discount rate could be insufficient to perform the work because funds called in from FA mechanisms are typically deposited into "special accounts"[18] or standby trusts, which are unlikely to grow at this annualized real rate.

[16] If a discount rate is applied to a cost estimate to establish an FA amount, it would take into account the time value of money—the general idea that a dollar today is worth more than a dollar tomorrow—by assuming that the initial FA amount would appreciate over time at a projected growth rate. The higher the discount rate that is applied, the less FA would initially be required, and the more it would need to appreciate to meet the anticipated funding needs at the site.

[17] See EPA Office of Solid Waste and Emergency Response, OSWER 9355.0-75, A Guide to Developing and Documenting Cost Estimates During the Feasibility Study (July 2000), p. 4-4, available at http://www.epa.gov/superfund/policy/remedy/pdfs/finaldoc.pdf (stating that the "specified rate of 7% represents a 'real' discount rate in that it approximates the marginal pretax rate of return on an average investment in the private sector in recent years and has been adjusted to eliminate the effect of expected inflation").

[18] Special accounts are site-specific, interest-bearing accounts within the Superfund. For documents concerning special accounts, view the Special Accounts category in the Superfund enforcement policy and guidance database, available at http://cfpub.epa.gov/compliance/resources/policies/cleanup/superfund/index.cfm?action=3&sub_id=1235.

Thus, the development of cost estimates in the 2016 FS was consistent with EPA's cost and financial assurance guidance and used the appropriate discount rate where the primary purpose is for comparing remedial alternatives during the remedy selection process.

It should be noted that while EPA used a 7 percent real discount rate for presentation of the alternative costs, a sensitivity analysis was performed for varying discount rates and presented in Appendix N of the 2016 FS. This is consistent with the recommendation in the third paragraph on Page 4-5 of EPA's *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study*.

EPA used a low mobilization/demobilization factor of 1.6%, while the 2012 draft FS used a 15% factor based on project experience at similar sites. EPA is basing its 1.6% percentage on the cost estimate used for the Lower Duwamish River FS—not real construction data.

EPA Position:
LWG is correct that construction data were not specifically used for determination of the mobilization/demobilization factor. However, EPA's *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (EPA 540-R-00-002), actual construction data is not required to be solely used. As indicated on page 5-6 of that guidance, "experience with similar projects, including both estimates and actual costs (bold emphasis added) can also be used as a source of cost data."

In addition, the determination of the percentage of the capital and periodic costs for mobilization and demobilization was based not just on review of Lower Duwamish River FS, but also the Passaic River FS, projects of similar scope and the equipment proposed for Portland Harbor FS.
The types of dredge can cap placement equipment proposed in the Portland Harbor 2016 FS (the primary pieces of equipment requiring mobilization/demobilization from beyond metro Portland) are fairly conventional in that they are barge mounted excavation and placement equipment and not unique types of dredge equipment such as suction dredges. In addition, the number of dredge plants and capping plants and attending scow barges and tugboats are relatively small given the duration of the project. Thus they should readily available in the Pacific Northwest given the multitude of shoreline projects along the Willamette and Columbia Rivers. EPA has thus assumed mobilization and demobilization are representative of expected regional mobilization and demobilization costs.

The use of a percentage of capital costs for mobilization and demobilization of equipment is reasonable for the FS level of scope detail and assumptions. Real construction data will be evaluated and presented during remedial design as necessary.

It should be noted that unlike alternatives for some Superfund projects, the primary differences between the alternatives for the Portland harbor Superfund Site is the size of the footprint of removal and containment based on the area of the SMAs defined for each alternative. Therefore, the cost differences between alternatives is reflective of the differing quantities calculated in the technology assignment modeling. Because the differences in capital and periodic costs are primarily based on quantity differences, the use of lower percentages for mobilization/demobilization costs do not impact the comparative aspects of the costs estimates between alternatives.

EPA used a contingency factor of only 20%, while the LWG's 2012 draft FS used 40%. EPA guidance indicates that the overall contingency for an FS should be in the 20 to 45% range. Thus, EPA is using the lowest possible contingency factor allowed by guidance. EPA cites guidance indicating that larger projects with high costs may have lower overall contingency factors. This may be true for some types of projects, but given the complexity of this Site and the large number of issues that will be refined in design, using the lowest possible contingency factor appears very optimistic and greatly decreases the estimated costs of the alternatives, particularly the largest alternatives.

EPA Position:
The stated accuracy in EPA's *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* for FS cost estimates at the detailed analysis phase is +50 to -30 percent of actual cost. EPA's position is that the cost methodology and sources used in the FS meet the stated accuracy range. The information provided in the cost estimate is based on the best available information regarding the anticipated scope of the remedial alternatives.

As described in Section 5.4 of EPA's *A Guide to Developing and Documenting Cost Estimates During the Feasibility Sutdy*, engineering judgment may be used to adjust rule-of-thumb percentages presented in Exhibit 5-6 for scope contingency with a lower contingency indicating that project scope will undergo minimal change during design. Due to the detailed level of conceptual design performed as part of the technology assignment modeling in the 2016 FS, the contingency percentages were modified to the low end of the recommended range presented in the guidance, to better reflect the detailed evaluation and concepts developed for the following items:

Per EPA's *A Guide to Developing and Documenting Cost Estimates During the Feasibility Sutdy*, contributing factors to scope contingency include the following:

- Limited experience with certain technologies
- Inaccuracies in defining quantities or characteristics
- Potential requirements due to regulatory or policy changes

Scope contingency would be expected to be higher for newer or emerging remedial technologies than for more well-documented systems. Each alternative was developed using similar technologies and major work activities. Conventional and proven technologies were used in the development of the alternatives with only few exceptions (in situ treatment areas) representing a relatively small percentage of the scope.

The primary differences between the alternatives is the size of the footprint of removal and containment based on the area of the SMAs defined for each alternative. Therefore, the cost differences between alternatives is reflective of the differing quantities calculated in the technology assignment modeling. The development of the RALs for each alternative established a boundary for the horizontal limits of dredging/capping based on available boring data. There is a vertical limit for dredge volumes in the shallow and intermediate areas based on the technology assignments, and this will limit the risk for potential growth of volume estimates in those areas.

EPA assumes all NAPL PTW will be dredged in the Navigation and FMD areas. However, the Willamette River currently has an authorized channel depth of -40 feet Columbia River Datum (CRD), and contamination at depths greater than the authorized depth of the navigation channel may be capped as long as the cap integrity is not impaired by future maintenance dredging.

Federal and State regulations were carefully evaluated and taken into consideration in the assignment of technologies (mitigation and floodrise) for development of all alternatives.

EPA ultimately selected a scope contingency (10 percent) within the parameters suggested by the guidance, after taking this information into account. For instance, Exhibit 5-6 of EPA's *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* indicates a recommended scope contingency range of 5 to 10 percent for surface grading/diking, 5 to 15 percent for bulk liquid processing, 5 to 15 percent for on-site and off-site disposal, 10 to 20 percent for sludge stabilization. All of these are activities that are part of the scope of the Portland Harbor alternatives and are at within the range of the scope contingency selected by EPA. While vertical barriers (10 to 30 percent) and soil excavation (15 to 55 percent) are at or higher than the selected value, the refined development of quantities and scope in the 2016 FS minimize the likelihood that significant unknowns and uncertainties remain that would result in large underestimation of costs requiring scope contingency.

Bid contingency accounts for changes that occur after the construction contract is awarded. Examples include:

- technological, geotechnical, and other unknowns applicable to the construction phase
- changes due to adverse weather
- material or supply shortages

Conventional and proven technologies were used in the development of the alternatives with only few exceptions. The site specific unit costs developed for the Portland Harbor Superfund Site and presented in Appendix G of the 2016 FS were generally in the range of costs at other contaminated sites in the Pacific Northwest. This reduces the risk of technical constraints during contractor bidding. Inputs and assumptions used in the development of the construction duration calculations included an in-water work window which is appropriate for the region.

A vast majority of the materials and supplies identified as necessary for remedial action are conventional and readily available (sand, DE, quick lime). EPA assumes commercial source of capping materials, and assumes that more than one source may be required. EPA confirmed that commercial suppliers could supply the required volumes.

EPA ultimately selected a bid contingency (10 percent) within the parameters suggested by the guidance, after taking this information into account. Page 5-11 of EPA's *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* indicates a recommended scope contingency range of 10 to 20 percent. This is within the range of the bid contingency selected by EPA.

Unlike alternatives for some Superfund projects, the primary differences between the alternatives for the Portland harbor Superfund Site is the size of the footprint of removal and containment based on the area of the SMAs defined for each alternative. Therefore, the cost differences between alternatives is reflective of the differing quantities calculated in the technology assignment modeling. Because the differences in capital and periodic costs are primarily based on quantity differences, the use of lower percentages for contingency do not impact the comparative aspects of the costs estimates between alternatives.

EPA used lower percentages for project management (2%), remedial design (2%), and construction management (3%) than EPA guidance (5%, 6%, and 6%, respectively). These factors are also lower than the 2012 draft FS, which used 15% for remedial design and a monthly rate for project management and construction management. Remedial engineering design costs at the Head of the Hylebos were roughly 15% of actual project costs.

EPA Position:

As described in Section 5.5 of EPA's *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, engineering judgment may be used to adjust rule-of-thumb percentages presented in Exhibit 5-8 for project management, remedial design, and construction management as well as the recommended range presented for technical support. As described in the 2016 FS, Appendix G, Attachment A, the percentages of professional and technical services costs will be higher for projects of smaller scope and lower for projects of larger scope. Due to the high overall costs for major work activities, the professional/technical percentages were modified to lower than the recommended

range presented in the guidance, to better reflect realistic costs for professional/technical services costs for these items.

It should be noted that unlike alternatives for some Superfund projects, the primary differences between the alternatives for the Portland harbor Superfund Site is the size of the footprint of removal and containment based on the area of the SMAs defined for each alternative. Therefore, the cost differences between alternatives is reflective of the differing quantities calculated in the technology assignment modeling. Because the differences in capital and periodic costs are primarily based on quantity differences, the use of lower percentages for these professional/technical services costs do not impact the comparative aspects of the costs estimates between alternatives.

See EPA's position above for additional information on basis for reduced remedial design percentage compared to Head of the Hylebos project.

There are significant equipment and contracting issues associated with executing multi-year projects where tens of millions of dollars of equipment need to be mobilized to the Site. The cost estimates do not factor in the standby costs created by idle equipment for two thirds of each year while the construction window is closed.

EPA Position:
The unit costs were developed assuming conventional equipment. It is assumed that market conditions in the Pacific Northwest and utilization of this conventional equipment for other projects will minimize standby time between work windows and costs incurred for standby outside the work window would be covered by contingency. See EPA's position above for additional information on mobilization and demobilization.

In Section 4.2.2.2, EPA discusses the need for air monitoring. Air monitoring costs do not appear to be included in the cost estimate. The June 2016 FS also cites the need for fish tissue monitoring during construction which is not reflected in the costs.

EPA Position:
Site-wide monitoring is included as a capital cost in year 1 and also as a periodic cost incurred every other year for the first 10 years and every 4 years through the period of analysis. Unit costs for these monitoring efforts were developed by Anchor QEA in the draft 2012 FS, and include fish tissue monitoring. Additionally, costs for environmental monitoring during offloading at transload facility is included in the estimate for transload facility development for the duration of construction. The unit cost allowance for environmental monitoring during offloading at transload facility were developed by Anchor QEA in the draft 2012 FS, and include costs for boat, monitoring equipment and chemical analysis.

As part of ARAR discussions in Section 4.2, air monitoring is identified as required "to ensure that contaminants that volatilize would not exceed acceptable health based concentrations and adversely affect local communities and workers." Air monitoring is a

minor scope component for the alternatives given that the majority of contamination in sediment throughout the Portland Harbor (PCBs, pesticides) does not readily volatilize. Location-specific needs for air monitoring (particularly PTW at the Area 6W and 7W SDUs) will be addressed during remedial design. The scope of site-specific air monitoring requirements will be identified during remedial design, and costs for these are captured in the scope contingency of the 2016 FS alternatives cost estimates given that the requirements at this time are not fully known.

LWG Dispute Issue 3

The FS fails to articulate a clear and understandable framework and schedule for implementation by which each alternative can be compared. For example, the FS states that "all the alternatives assume the remedy will be implemented as described. That is, there would be no changes identified during remedial design. However, due to the uncertainty inherent at Superfund sites, there will be adjustments made throughout the design and construction process."3 Nothing in the FS describes what adjustments are possible or how those adjustments would be determined, and, in contradiction to this assertion, EPA's prescriptive technology assignments are carried through to the Proposed Plan. Similarly, the timeframes for all alternatives are described to include a "Year 0" "initial conditions" assessment expected to take 3 to 5 years to complete, and a subsequent set of "Year 0" start-up activities, including "pre-design investigations."4 No time is allowed in the schedule for preparation and approval of actual remedial engineering design. "Year 0" is also identified as "the first year of construction."5 Therefore, "Year 0" for all alternatives appears to mean more than 3 actual calendar years, but it is impossible to tell from the FS how many actual calendar years are rolled up into "Year 0" for any given alternative. EPA should provide a realistic vision and timeframe for implementation of its alternatives, and EPA should clearly identify in its alternatives development and decision trees that sediment management areas and technology assignments and process options will be refined and adjusted through remedial design and implementation.

The EPA June 2016 FS fails to articulate a clear and understandable framework and schedule for implementation by which each alternative can be compared.

EPA's June 2016 FS continues to be very unclear on EPA's vision for actual implementation of its selected remedy. On the one hand, it suggests in a few places that some elements of the remedy will need to be further defined or adjusted or modified during remedial design. On the other, it states definitively that the "remedy will be implemented as described. That is, there would be no changes identified during remedial design." Further, the schedule outlined by EPA for remedial implementation is impossible on its face – as discussed above, "Year 0" for every alternative contains a minimum of 4 years of activities.

Generally speaking, EPA continues to use a prescriptive set of technology evaluation and scoring criteria to determine the technologies to be applied in each area of the site. Given the deficiencies in the FS described above, and given the lack of evaluation of

SDU-specific information, Figure 3.8 presents an entirely-too-prescriptive approach to technology assignments. As the LWG previously commented, EPA's approach prevents meaningful comparison of the performance of various technologies in the FS, and because the technology assignment is based on FS-level information, the prescriptive set of evaluation criteria will not appropriately or accurately predict the most appropriate technology assignments or configurations for remedial design based on data available at the time of design, including data collected post-ROD. For example, those assignments are based on overall general assumptions regarding slopes, presumed "wave zones," and required depths of removal to reach protective levels. With respect to riverbank contamination and presumed groundwater contamination, they are based solely on those general broad designations, without consideration of which COCs are present and conditions of exposure. By contrast, the Corps of Engineers capping guidance document provides design level guidance of modeling and assessment methods to determine the concentration of contaminants of concern that can be safely isolated by capping. EPA's process and these figures should build in the flexibility needed to evaluate the likely performance of technologies against RAOs in the context of the complexities of each particular SDU.

EPA should clearly explain the conditions under which changes to major alternative elements (e.g., changes in technologies assignments, methods to address PTW, methods for determining treatment and disposal requirements, requirements for rigid containment) might be considered or allowed. EPA should explain how new data, including the "initial conditions" assessment will affect the RAL boundaries based on surface sediment concentrations. The FS should include language to allow for updates to risk assessments. EPA should incorporate decision frameworks, such as the capping demonstration decision tree that was discussed during development of the June 2016 FS. No defined processes are in place for proposing equally or more effective capping options or other technology refinements based on detailed design-level evaluations and new data. EPA should explain how the remedy would be implemented spatially (e.g., operable units, groups of SMAs) and provide transparent and reasonable disclosure of when the community can expect cleanup to actually begin.

EPA Position:

The LWG provided no regulatory or guidance support for their contention that the 2016 FS should have contained a framework and schedule for implementation. Neither the NCP nor FS guidance speaks to the need for a schedule for implementation for each alternative. The gist of the LWG's concerns appear to be more about wanting to know what the areas of flexibility may be in applying the decision trees moving into implementation because they read the 2016 FS to say that no changes to the technologies could be made in remedial design.

The LWG's concern is unfounded. The LWG took the 2016 FS quote from page 3-39 out of context and misinterpreted it. Here is the full text of the relevant FS section:

Remedy Implementation

For the purposes of the FS and developing remedial alternatives, the sequence of dredging is assumed to be from RM 11.8 to RM 1.9. However, during remedy design and construction, it may be more effective to deviate from this approach.

All the alternatives assume the remedy will be implemented as described. That is, there would be no changes identified during remedial design. Due to the uncertainty inherent at Superfund sites, there will be adjustments made throughout the design and construction process." Page 3-39 of 2016 FS.

Furthermore, a word search for "remedial design" in the 2016 FS found 23 issues on which the document stated that further evaluation in remedial design would be necessary. Further, the 2016 FS acknowledges in several places that the technology assignments were **assumed** for various areas.

LWG Requested Relief #1
EPA's June 2016 FS should not be used as a basis for a Record of Decision for the Portland Harbor Superfund Site.

EPA Position:
The 2016 FS is based on good science – many principles are from LWG's draft 2012 FS, data collected by LWG during the RI phase, and consistent with the findings of the baseline risk assessments, the NCP and EPA policy and guidance for developing an FS.

LWG Requested Relief #2
The alternatives analysis in the LWG's 2012 FS provides an adequate basis for selecting a remedy at the Site.

The Disputing Respondents stand behind the LWG's 2012 draft FS, which incorporated good science, provided the required comparative analysis of alternatives, and relied on realistic estimates of cost and time to perform work. The Disputing Respondents were prepared to fully engage with EPA and resolve EPA's comments and concerns in order to produce a report that provided a credible basis for EPA's selection of a remedy that conformed to CERCLA, the NCP, and EPA guidance. EPA's unwarranted deviation from the RI/FS process agreed to by EPA in 2001 and set forth in the NCP has created a methodology that does not allow sufficient time for review, consideration and revision of the flawed FS, and is an abuse of discretion. A Record of Decision based upon the June 2016 FS will likely lead to an ineffective cleanup that cannot be implemented in a timely manner.

EPA Position:
By letter dated, December 18, 2012, EPA disapproved the LWG's 2012 draft FS and provided a list of seven significant deficiencies with the 2012 draft along with a table of 96 comments raised by the Technical Review Team. **[AR Doc # 100007297 through 100007299]** As described in the Introduction Section of this Response, EPA has been

transparent and open about the modifications it viewed were needed to the LWG's 2012 draft FS and shared drafts of its modifications with the LWG over the past two to three years. The LWG has had significant opportunity to raise its concerns, which they fully took advantage of, which our administrative record demonstrates. The deficiencies EPA identified with the LWG's 2012 draft FS, not surprisingly comprise many of the issues the LWG now dispute. They even continue to dispute the background methodology that EPA's Dispute Official thoughtfully considered and documented his rationale for upholding EPA's methodology. The LWG has had significant due process to raise its issues throughout the RI/FS development, but EPA had legitimate concerns with the LWG's draft FS. The modifications that EPA made to the FS are supported by the administrative record and consistent with CERCLA, the NCP, and EPA guidance.

Contrary to their February 2016 agreement that it was appropriate for EPA to finalize the FS, the LWG complains that EPA should have worked with them to solve the problems with their 2012 draft FS and it was an abuse of discretion for EPA to have finalized the FS rather than use their draft FS. Page 22 of LWG Dispute Statement. The relief they seek is that EPA should use their 2012 alternatives analysis for selecting a remedy at the Site. Although the scope of this dispute is limited to issues about the 2016 FS, the LWG have placed at issue the quality of the alternatives analysis in their 2012 draft and whether that analysis should be used to make the remedy decision, to which we must provide a response.

As the various responses to dispute issues above have noted, EPA used a lot of the LWG's analysis from their 2012 draft FS, which at the time they submitted it, they heralded it as sufficient for decision-making. As demonstrated above, many of their problems with EPA's 2016 FS is based on their analysis they now claim is flawed or should not have been used. Apparently if the analysis is in EPA's 2016 FS its wrong, but it's fine and useable in their 2012 draft FS. The deficiencies and comments contained in EPA's December 18, 2012, letter document sufficient basis to deny the relief they now seek. Additionally, a more detailed analysis of the failings with their hydrodynamic and sediment transport ("HST") model is contained in Section 4.2.1 and Appendix H of the 2016 FS. The LWG's flawed HST model was a fundamental basis for their alternatives analysis and conclusions; therefore, any decisions based on their alternatives analysis would also be significantly flawed.

EPA has fully considered all of the issues that the LWG, collectively, as well as individually have raised on EPA's 2016 FS. Many of the LWG's issues do not even apply to the 2016 FS, but rather were issues they raised on the August 2015 draft which EPA addressed in the 2016 FS. Likewise, other concerns they raise are actually concerns about their own analysis that EPA used in developing the 2016 FS. The LWG has not provided any reason for EPA to abandon its 2016 FS. EPA complied with the CERCLA, the NCP, and EPA guidance in developing its 2016 FS and it is more than adequate for supporting a final remedy decision for the Portland Harbor Site.

SDU and Upland Site Specific Issues for Disputes

Arkema Dispute Issue 1 - Riverbank contaminants adjacent to the Arkema Site
EPA added sites and edited the discussion of riverbanks and groundwater in Section 1 of the FS.
Based upon our preliminary review, the identification and presentation of these sites contain multiple errors. For example, PCBs are listed as a riverbank contaminant at Arkema, but have only been detected in a small number of samples below the applicable screening levels (with one exception, one sample slightly exceeded a conservative bioaccumulative SLV). Two key issues are: (1) risk-based PRGs should not be established based on exposure pathways being evaluated as part of the upland source control evaluations under DEQ, and (2) that none of these upland media were evaluated in the BLRAs or RI. EPA's use of sediment PRGs for riverbanks, which were applied to areas rarely inundated by the river and without considering fate and transport (e.g., attenuation), is technically unsupportable and inappropriate. Delineations of groundwater plumes and riverbanks, and a zero post-construction restoration timeframe are unsupportable.

There is a lack of data and analysis as to what risk considerations are driving the specific remedial actions (and therefore how such analyses will be refined in the design phase when further data/analysis is available) and what specific remedial actions will be implemented in which areas driven by such risks. This opaque delineation is then carried into the evaluation of alternatives and used to assess the relative effectiveness of alternatives. This appears to significantly bias the outcome of alternative selection.

The June 2016 FS fails to include a discussion of upland source controls that have been implemented as well as failing to include anything related to the performance of source controls in the remedial evaluations.

Source control measures taken at the Arkema Site have largely eliminated the stormwater pathway from this site. Groundwater controls, namely the installation of a slurry wall and a groundwater extraction and treatment system designed to prevent migration from the uplands to the river, have eliminated the groundwater pathway.

EPA Position:
See EPA's position to LWG's dispute issue 1q.

Arkema Dispute Issue 2 - Principal Threat Waste adjacent to the Arkema Site
EPA inappropriately identifies chemicals in sediment adjacent to the Arkema Site as PTW based on either a "source material," "not reliable contained," or "highly toxic" criterion. Source material has never been identified in Arkema Site sediment, EPA should not identify chemicals that can be reliably contained as PTW, and chemicals that require long-term exposure durations through indirect exposure pathways (i.e., consumption of fish tissue) should not be identified as "highly toxic." In addition, the blanket identification of large areas with low concentrations of chemicals in sediments as PTW is

neither required by the National Contingency Plan (NCP) nor necessary to protect public health or the environment.

EPA errs when it misidentifies source material based on "globules or blebs of product in surface and subsurface sediments…" and when it states that "NAPL observed in sediment cores offshore of Arkema contains chlorobenzene and DDT (dissolved)." Arkema responded to CDM Smith's 2013 memorandum (Attachment Ark-1) that purports to identify NAPL at the Arkema Site. To resolve the issue, Arkema prepared a work plan in response to EPA requests under the EE/CA Administrative Order on Consent (AOC) to confirm that NAPL was not present in sediment adjacent to the Arkema Site (Integral 2016). In addition, no samples offshore of the Arkema Site have identified the presence of an MCB DNAPL. There is no data that supports EPA's statement that NAPL observed in Arkema sediment "…contains chlorobenzene…." Significantly, a document titled "Top 10 State Issues for Proposed Plan" obtained from the LWG's Freedom of Information Act (FOIA) request identified that based on Oregon DEQ's review of the data "The multiple phases of sediment investigation have not encountered sediment exhibiting NAPL saturated conditions that would warrant thermal treatment prior to management." The status column for the same issue states that "EPA agreed to not assume NAPL at Arkema for the purposes of the cost estimate" (Attachment Ark-2). Based on these records, we conclude that EPA and DEQ agreed that there was no chlorobenzene NAPL in offshore sediments, and therefore the assertion that such sediments represent PTW Source Material as defined by EPA's PTW fact sheet is without foundation, acceptance, or support.

EPA also erred when it identified an extensive area of groundwater containing chlorobenzene DNAPL discharging to the river as "not reliable contained" (Attachment Ark-3). In fact, there is no documented MCB DNAPL groundwater plume. EPA's Figure 3.2-4, adjacent to the Arkema Site, is inaccurate and misleading. The nature and extent of chlorobenzene DNAPL in groundwater and/or sediment pore water as shown in this figure is not based on actual site data. Groundwater SCMs have been implemented at the site beginning in 2012, including an upland groundwater barrier wall and extraction and treatment system. The groundwater pathway to the river from upland areas where chlorobenzene DNAPL may have been present in upland groundwater has been isolated from site sediments. Containment has been in existence for nearly four years.

There is no scientific evidence that supports the existence of an ongoing source of MCB DNAPL to the sediment adjacent to the Arkema Site. Groundwater and pore water sampling conducted after the implementation of the SCM has not identified a MCB DNAPL source to sediment adjacent to the Arkema Site. This site characterization error which postulates an extensive area of chlorobenzene DNAPL in sediment at the Arkema Site biases the assessment and comparison of the effectiveness of alternatives as evidenced from the following text: "Alternative D has less capped area (71 acres), but does not reliably contain all PTW remaining in the river." (USEPA 2016, p. ES-15). Without an accurate assessment of PTW and PTW areas (in this case, DNAPL), EPA's alternatives evaluation is highly inaccurate.

EPA also errs when it misidentifies areas of the Arkema Site (including certain areas upstream and downstream of Arkema; Attachment Ark-3) as containing "highly toxic" PTW based on surface sediment concentrations for DDx, 2,3,7,8-TCDD, 2,3,7,8-TCDF, 1,2,3,7,8-PeCDD, 2,3,4,7,8-PeCDF, and 1,2,3,4,6,7,8-HxCDF that exceed a 10-3 excess cancer risk level for fish consumption based on the fish ingestion risks from the baseline human health risk assessment (BHHRA). This definition of highly toxic based on a long-term (30-year) exposure to a chemical substance via a fish consumption pathway is not consistent with the intent of EPA's PTW fact sheet. These 10-3 risk levels include long-term exposure parameters and indirect exposure based on a 30-year subsistence fish consumption scenario, which does not meet the definition of highly toxic (i.e., toxic under a direct contact or acute exposure scenario). Highly toxic levels should be based on direct exposure conditions only. Furthermore, the 10-3 excess cancer risk is only a suggested basis and is not prescriptive.

The EPA's proposed highly toxic PTW levels should also be considered in a broader context.
EPA's highly toxic PTW values for some constituents are well below cleanup levels and screening level for unrestricted use established for other sites and scenarios. For example, the PCB PTW value of 200 µg/kg is below cleanup goals for many other CERCLA sites, which are at or above 200 µg/kg. The EPA regional screening level (RSL) for residential soil in fact is 249 µg/kg; in other words, soil/sediment with PTW levels specified in the FS could be used as clean fill at homes, schools, and day care facilities. In this context it does not make sound technical or risk management sense for the PTW level to be set at 200 µg/kg.

An approach more consistent with the intent of EPA's PTW guidance would be to set the PTW level at a 10-3 risk value based on direct contact to sediment (removal action objective 1 [RAO1]); that would be the lower of the 10-3 risk level (370,000 µg/kg), the hazard quotient (HQ) of 10 (147,600 µg/kg) (as stated in the guidance), or for the PCB case, the TSCA waste threshold (50,000 µg/kg). The use of the TSCA threshold for PCBs is also consistent with decisions at other CERCLA sites. A similar approach should be taken for the other constituents for which highly toxic PTW has been identified, especially dioxins/furans for which the PTW level in the FS is less than 3 times the EPA-recommended preliminary remediation goals PRG for dioxins/furans (once toxicity equivalence factors (TEFs) are applied).

EPA Position:
See EPA's position to LWG's dispute issue 2c and LSS dispute issue 2.

Arkema Dispute Issue 3 - Flawed evaluation used to determine whether PTW can be reliably contained
There is no scientific support for the assertion that there is NAPL or PTW in the sediments adjacent to the Arkema Site. According to EPA, PTW is a concept used in the NCP to characterize contaminant source material (USEPA 1991). PTWs are those source

materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. In the 1991 guidance, EPA stated their expectation that PTW would be treated, wherever practical, because of current technical limitations of long-term reliability of containment technologies. The long-term reliability of containment of certain NAPL PTWs has improved through the development and implementation of reactive capping, as demonstrated by EPA (USEPA 2013).

The draft final FS does consider and propose reactive capping but uses a flawed screening analysis to limit its use by designating certain SMAs as PTW NAPL/NRC, reflecting those areas where purported NAPL is deemed not reliably contained (NRC). Furthermore, the draft final FS is not consistent with the EPA guidance on principal threat and low-level threat wastes (LTW) (USEPA 1991), as it does not differentiate PTW from LTW NAPL based on toxicity, mobility, and (realistic) reliability of containment, but uses NAPL and PTW interchangeably. For instance, for shallow areas it states that NAPL or PTW that is not reliably contained within an SMA would be dredged to the lesser of the RAL concentrations or 15 feet.

To determine the boundary for where PTW can be reliably contained, two limited capping options were modeled in Appendix D to determine the maximum concentrations of PTW material that would not result in exceedances of AWQC in the sediment cap pore water after a period of 100 years. Contaminants modeled were chlorobenzene, dioxins/furans, DDx, naphthalene, PAHs, and PCBs. Appendix D contains the following errors of commission or omission:

- *The objectives of the analysis are not clearly defined or stated. The document states "this appendix is evaluating whether or not PTW at the Site can be reliably contained under specific assumptions." What are the assumptions that justify a conclusion that the maximum containable sediment concentrations of chlorobenzene and naphthalene are 320 µg/kg and 140,000 µg/kg, respectively?*
- *The two potential active cap designs modeled (thickness of capping layers and amount of active material in cap for a reasonably conservative approach and a more aggressive augmented capping approach) are not representative of the current state of practice for reactive capping and so cannot be used to determine the contaminant concentrations that cannot be reliably contained.*
- *The long term reliability of a reactive cap is a direct function of the thickness of the reactive layer and the amendment(s). A more reliable reactive cap with a thickness greater than 12-inches and consisting of a lower layer of organo-clay and an upper layer of GAC should have been considered in Appendix D.*
- *Maximum pore water concentration of chlorobenzene used as a continuous source term in the model is based on the relatively old Remedial Investigation (RI) database and is not representative of current conditions, let alone for the next 100 years. In addition, EPA has used data that were not collected pursuant to the RI. EPA has used reconnaissance data collected using a Geoprobe rig. The data are unacceptable for, and cannot be used to represent, pore water chlorobenzene concentrations. Therefore, the maximum pore water concentration EPA used is based on inappropriate data and needs*

to be replaced in the model. Since the RI data collection, a barrier wall and pump-and-treat system have been installed along the shoreline of the Arkema Site. Furthermore, maximum data are not appropriate for assessing engineering performance, including reliability. A more appropriate input parameter is the 90th percentile concentration.
• A range of seepage velocities (0.3, 3, and 30 cm/day) were evaluated, representing the minimum, average, and maximum values measured at the Site. However, actual seepage velocities in SMA 7W are likely lower than 0.3 cm/day due to presence of the barrier wall and pump-and-treat system.

EPA Position:
See EPA's position to LWG's dispute issue 2c and LSS dispute issue 2.

EPA did not establish any boundaries of waste in the 2016 FS. EPA developed estimates of various types of waste to estimate costs in the 2016 FS. The figures show the extent of the evaluation based on various assumptions identified in the 2016 FS report. Boundaries and cap designs will be established in remedial design. EPA agrees that additional data collection will be required to determine the appropriate design and waste treatment and disposition requirements during remedial design.

Arkema Issue 4 - Inappropriate waste designation for sediments adjacent to the Arkema site
The assumed areas for disposal of sediment as RCRA waste (Figure 3.4-35, Attachment Ark-4) are based on a single toxicity characteristic leaching procedure (TCLP) sample for lead and no TCLP samples for chromium. Based on sediment analytical results, the area shown on Figure 3.4-35 does not represent sediment that will require RCRA Subtitle C landfill disposal. The State-listed pesticide residue designation also does not necessarily apply to sediment at the Arkema Site (Figure 3.4-36, Attachment Ark-4). As recently as February 2016, DEQ was researching the issue of whether sediment near Arkema would be designated a State-listed pesticide waste. Item 3 of the "Top 10 State Issues for Proposed Plan" document obtained from the LWG's FOIA request (Attachment Ark-2) states that "Sean needs State determination of State-only pesticide question, which Matt is researching." However, even if it is determined that some portion of the sediment is a State-listed pesticide residue waste, it would not preclude the placement of this sediment in a CDF (see HWIR discussion below) or disposal in a Subtitle D landfill out of state. When a State-listed hazardous waste is transported out of state (for example, to the Roosevelt Regional landfill as presented in the FS), the Oregon State waste designation no longer applies, and the waste can be disposed as a non-hazardous waste so long as it meets other landfill disposal criteria. This was recently demonstrated by the disposal of soil from the Arkema Stormwater and Groundwater SCMs, at the RCRA Subtitle D Roosevelt landfill in Washington.

Arkema disagrees with the cost assumption that "cement solidification/stabilization, low temperature thermal desorption, and no treatment will be used in equal proportions to treat pesticide/chlorobenzene PTW" for the disposal of dredged sediment that meets

EPA's PTW criteria from the Arkema Site. Notwithstanding the fact that there are no PTW sediments currently identified off the Arkema Site, the FS fails to clearly outline the basis for EPA's assumptions regarding treatment as a prerequisite for offsite disposal. Section 3.2.2.3 fails to clearly identify specific regulations and the conditions under which they are assumed to apply, or not apply, to sediments that are designated as PTW and the mechanism under which they derive need for treatment prior to offsite disposal. Furthermore, the "Top 10 State Issues for Proposed Plan" document obtained from the LWG's FOIA request (Attachment Ark-2) states that "DEQ wants to be clear that land disposal of these sediments does not require treatment under Oregon Administrative Rules." As presented, EPA has arbitrarily made more conservative assumptions for disposal of PTW defined by sediments purportedly containing DDx and NAPL than it has for PCBs, dioxin/furans, and PAHs.

EPA Position:
See EPA position to LSS dispute issue 3.

Arkema Dispute Issue 5 - Inappropriate application of the Hazardous Waste Identification Requirements (HWIR) Rule for disposal of sediment in a CDF
EPA asserts that "Dredged material subject to requirements of a permit that has been issued under Section 404 of the CWA is excluded from the definition of hazardous waste (40 CFR 261.4(g)). This provision is discussed in the Hazardous Waste Identification Rule (HWIR) (63 Federal Register [FR] 65874, 65921; November 30, 1998). Oregon State adopted the HWIR rule in 2003. This rule means that RCRA regulatory requirements do not apply to sediment dredged at the Site and disposed of on-site, such as at the Terminal 4 CDF, if the material otherwise meets the CDF acceptance criteria." (emphasis added)

EPA has correctly stated that RCRA regulatory requirements, including the designation of waste sediment as either a Federal or State-only hazardous waste, do not apply to sediment placed in a CDF; however, the statement mischaracterizes the CWA requirement that the sediment must meet CDF acceptance criteria for this rule to apply. This is not the case. Because DEQ has adopted the federal HWIR rule, and the CDF would meet CWA Section 404 requirements, RCRA Subtitle C requirements would not apply, and the dredged material placed in the CDF would not be a hazardous waste. The disposal of Arkema sediment in a Terminal 4 CDF should, therefore, be considered. The failure to consider CDF disposal for Arkema dredged sediment artificially inflates the disposal costs for alternatives related to the dredging at the Arkema Site. EPA disregards the scope and intent of the HWIR Rule by placing arbitrary restrictions on what EPA believes can be placed into the T4 CDF if constructed. All of the EPA's Acceptance Criteria for the T4 CDF are arbitrary and should be removed. Disposal of dredged material should follow the HWIR Rule as adopted by the State. This arbitrary action by EPA has severe negative implications for the FS and any subsequent RA.

EPA Position:
See EPA's position to LSS dispute issue 4.

Arkema Dispute Issue 6 - Inappropriate use of PCB non-detected values in RAL and PTW footprint maps

The RAL and PTW footprint maps incorporate data with high PCB detection limits adjacent to the Arkema Site (Attachment Ark-5). The high PCB non-detects with detection limits 5 times EPA's PTW value (e.g., >1 mg/kg) occurred in the Aroclor analysis as a result of a matrix interference with DDx. The RAL and PTW footprint maps should only consider detected PCBs based on PCB congener concentrations adjacent to the Arkema Site. The identification of PTW and remediation footprints for PCBs adjacent to the Arkema Site based on non-detect values with elevated detection limits resulting from matrix interference with DDx is inconsistent with EPA's PTW guidance and biases the assessment of PTW and remediation footprints for the SDU RM7W alternatives. This exaggerated PCB footprint will also bias the alternative selection for SDU RM7W.

EPA Position:

See EPA's position to LSS dispute issue 6.

Arkema Dispute Issue 7 - Inaccurate RAL and PTW footprint maps

The PCB and PCDD/F RAL and PTW maps were contoured using natural neighbors gridding and did not account for the flow direction or depositional environments in a river system. The RAL and PTW maps in EPA's FS used nearest neighbor interpolation, and data points were inappropriately interpolated through upland areas. An example of this inappropriate interpolation is between points in the Willbridge Terminal and the area between Dock 1 and the Salt Dock on the Arkema Site (Figures 3.4-7, Attachment Ark-5; 3.4-11, Attachment Ark-6). In this example, the points are not correlated and should not be interpolated through the upland portion of the Arkema site. The RAL and PTW maps must include some interpretation to reflect the physical features of the site and site uplands, as well as the hydrodynamics of a river system.

EPA's Position:

See EPA's position to LSS dispute issue 6.

Arkema Dispute Issue 8 - Background concentrations for PCDD/F compounds in sediment

Sediment PRGs for RAO2 and RAO6 as well as riverbank PRGs for RAO9 for the five PCDD/Fs congeners are based on background concentrations. Background PCDD/F concentrations for individual congeners are presented in Appendix B, Table B2-4 of EPA's FS.

EPA uses new methods for deriving these levels that appear significantly different from both EPA's methods for other chemicals as well as past LWG input on this subject. Sediment PRGs for RAO2 and RAO6 as well as riverbank PRGs for RAO9 for the five PCDD/Fs congeners are based on background concentrations.

The background values are based on limited and poor quality data (with elevated detection limits). In fact, only one congener has sufficient data (1,2,3,4,7,8-HxCDF) to calculate a background value and even that is limited (13 of 31 samples were non-detects). Thus, most of the background "values" are based on a 95% UCL of the detection limits. The background values also appear skewed quite low compared to other urban watersheds.

The background values estimated based on this limited data and approach, furthermore, are approximately an order of magnitude lower than values from other regions and watersheds. For example, a memorandum published by EPA in 2010 provides a good summary of background levels for dioxins/furans in sediment, which range from approximately 2–5 parts per trillion (ppt) as TEQs. It also summarizes values from Puget Sound which include a TEQ value of 4 ppt for non-urban areas but allowing up to 10 ppt as TEQs for open water disposal; this value is also used in San Francisco Bay and elsewhere. (https://klamathrestoration.gov/sites/klamathrestoration.gov/files/EPA%20Klamath%20dioxin%20memo%201-13-10%20final.pdf). The Duwamish Waterway FS establishes an upper bound background value for dioxins/furans as 11.6 ppt TEQ.

Background values in other regions and watersheds are expressed as TEQs, which is generally the manner in which cleanup goals for dioxins/furans are expressed. For Portland Harbor, EPA used 5 individual congeners. The individual congener background values provided in Appendix B of the FS and in the PRG tables for RAOs 2 and 6 can be converted to TEQs using TEFs, which results in a value of 0.56 ppt on a TEQ basis (since the 5 congeners equate to the majority of the risk, this value may be slightly biased low, but probably less than 10% of the total TEQ). This background value is an order of magnitude or more lower than the range of values, mainly for non-urban areas, from the literature. A study to better define background levels for dioxins/furans is necessary since the calculated risk-based PRGs are well below even these low-biased background levels resulting in the background values being adopted as the final PRGs. Otherwise, it is unlikely that the remedies for dioxins/furans will be successfully implemented and estimated risk reductions for dioxins/furans will be realized. This latter issue addresses the validity of the alternatives analysis and its biased outcome.

It should also be noted that no background values are listed for RAOs 1 or 3. Those PRGs are expressed as TEQs and data is lacking to identify a background level on a TEQ basis. Those PRGs may be below background. In fact, the PRG for RAO3 is four orders of magnitude below the MCL and is likely not reliably measurable at that level. Overall, providing PRGs that are below MCLs is inconsistent with other cleanup actions under CERCLA or other programs. Cleanup to below MCLs is unlikely to be achievable.

EPA Position:
See EPA position to LWG dispute issue 1h and LSS dispute issue 11a.

Arkema Dispute Issue 9 - Background Concentrations in other COCs and media

The FS (Section 2.2.2.4) states that only sediment background concentrations were estimated and background concentrations for other media could not be calculated due to insufficient data. However, surface water background concentrations were calculated in the RI. Upriver surface water background concentrations of COCs are orders of magnitude higher than the ARARs based on the AWQC. Note, the background UCLs for upriver surface water (dissolved concentrations with outliers removed; Table 7-4b of RI) vs RAO3 AWQC-based PRGs. For example, the background concentrations and ARARs for DDT, PCBs, and TCDD TEQ demonstrate examples of RAOs that are less than background:

- *background UCL for DDT = 0.000114 µg/L and the ARAR (RAO3) is 0.00002 µg/L;*
- *background UCL for PCBs = 0.000126 µg/L and the ARAR (RAO3) is 0.000006 µg/L; and*
- *background UCL for TCDD TEQ = 0.000126 µg/L and the ARAR (RAO3) is 0.000000033 µg/L.*

Because of the deficiencies in determining the background levels, a new background study for sediment, surface water and tissue needs to be conducted in the design phase. The results of this evaluation need to be used to update PRGs, RALs and SDUs.

EPA Position:
See EPA's position to LWG dispute issue 1g and LSS dispute issue 11b.

Arkema Dispute Issue 10 - Benthic risk models do not honor the measured data
EPA made extensive changes to the benthic approach for this FS, but those changes are still inconsistent with the comprehensive benthic risk approach contained in the approved BERA. The FS states:
"The protection of benthic species to contaminated sediment is evaluated using the benthic risk area defined by an order of magnitude greater than the RAO5 PRGs. The post-construction interim target for RAO5 was established at 50% reduction in the area posing unacceptable benthic risk." So, instead of using the CBRA, EPA now maps benthic PRG exceedance factors on a point-by-point basis and uses a 10 times exceedance factor to identify areas of concern. EPA then concludes that if 50% of this area is actively remediated, the alternative is "protective" on an interim basis. It is unclear how this new method is: (1) more accurate or consistent with the BERA, or (2) more predictive of benthic risk or the effectiveness of the alternatives, as compared to simply using the CBRAs, which are entirely consistent with the BERA.

Furthermore, and most importantly, the benthic risk models used by EPA do not honor the measured data. Although the LRM and FPM are model predictions using data from the toxicity texts conducted with site sediments, much of the measured data is not considered or addressed in this evaluation. Any modeled risk for benthic invertebrates that ignores actually toxicity testing results needs to be assessed in weight-of-evidence and river-mile specific decision-making. The benthic risk footprints should not extend into areas shown to have a lack of toxicity based on actual laboratory toxicity tests. This error has been carried through the alternatives analysis and therefore has biased the selection of alternatives for SMAs in the FS.

EPA Position:
See EPA Position to LWG dispute issue 1b and LSS dispute issue 12.

Arkema Dispute Issue 11 - Overly prescriptive decision trees
The FS acknowledges uncertainties in site characterization and the conservative assumptions used to form the basis for associated technology assignments, however EPA continues to use a prescriptive set of technology evaluation and scoring criteria to determine the technologies to be applied in each area of the site and, with the exception of a vague paragraph in Section 3.8.1, the FS is silent regarding the degree of flexibility that is envisioned to be available during remedial design to refine technology assignments based on the additional information gained through future pre-design investigations. This will lead to a lack of flexibility with regard to technology assignments, depth of removal, potential improvements in technology, design efficiencies to address remedial, and CWA/ESA requirements, among other things.

EPA should clearly explain the conditions under which changes to major alternative elements (e.g., changes in technologies assignments, methods to address PTW, methods for determining treatment and disposal requirements, requirements for rigid containment) might be considered or allowed. EPA should explain how new data, including the "initial conditions" assessment, will affect the RAL boundaries based on surface sediment concentrations. The FS should include language to allow for updates to risk assessments. EPA should incorporate decision frameworks for proposing equally or more effective capping options or other technology refinements based on detailed design-level evaluations and new data.

EPA Position:
See EPA's position to LSS dispute issue 14.

Arkema Dispute Issue 12 - Prescriptive dredge residuals management strategy
The prescribed application of 12-inches of sand across the entire dredge footprint (amended with AquaGate+PAC in areas where PTW present) is poorly supported. The FS is misleading in stating that the placement of sand (and GAC in areas where EPA has speculated that PTW is present) immediately following dredging will eliminate the need for additional dredge passes. The FS indicates that sediment cores would be taken post-placement to verify that thin-layer residual cover successfully reduces residuals concentrations. It is inappropriate to assume a 12-inch layer of residuals management cover will be applied across the entire dredge footprint, without providing a strategy that will determine the necessity for thinlayer placement and flexibility to develop an appropriate thickness.

As PAC can be toxic to benthic organisms, overall quantities and where and how it is applied warrants more thoughtful consideration. The FS neglects to consider the physical stability of PAC in the deployment of the thin-layer residuals cover. PAC will be ineffective if it immediately washes away. The FS neglects to consider any possible

unintended consequences that may be posed by transport/erosion and aggregation of PAC (with or without adsorbed contamination) in depositional areas. The assumed performance requirements for this residuals strategy are unclear.

EPA Position:
See EPA's position to LSS dispute issue 15.

Arkema Dispute Issue 13 - Inappropriate use of rigid containment technologies
EPA assumes the use of sheet pile barrier walls as dredge water quality control measures based on the suspected presence of NAPL will support the short term effectiveness of all alternatives. The FS still fails to adequately evaluate the implementability, effectiveness, and cost of this particular technology relative to other technologies and BMPs.
In making gross assumptions for this FS, EPA has disregarded the complexity of constructing such barrier walls (e.g., consideration of structural components such as king piles and structural bracing, or more complex cofferdam structures) and the associated impacts this will have on numerous aspects of remedy implementation ranging from construction duration (e.g., time required to install walls, and impacts to dredge production rates) to the overall net benefit and cost effectiveness relative to other means. EPA also continues to show figures that depict sheet piling in greater than 50 feet of actual water depth, which is technically infeasible. These figures also imply that sheet piles will be installed in the navigation channel, which would infeasibly obstruct vessel traffic. Sheet pile would also impact ongoing water dependent operations and nearshore fish migration does not evaluate whether sheet piles in the navigation channel could be permitted by USACE.

EPA Position:
See EPA position to LSS dispute issue 16.

Arkema Dispute Issue 14 - Risk reduction between alternatives
The calculated post-construction risks and HI values are higher than the interim target risks and HI. Because much of the remedy relies on MNR, the lack of a residual risk estimation process for time intervals post-construction (up to year 30) limits the usefulness of the residual risk estimates in terms of comparing the protectiveness of the remedies.

Furthermore, there is very little difference in net risk reduction between Alternatives B and I for almost all COCs. For most of the COCs, the differences are less than a factor of 2 and sometimes much smaller (e.g., difference in HQ of 0.25). Given the very conservative assumptions that were used to calculate PRGs, differences in estimated risks by a factor of 2 or less are not significant. A more reasonable criterion for evaluating differences in estimated risk between alternatives would be a factor of 10, which should be considered the minimum significant difference given the limited sensitivity of these criteria. A probabilistic-type risk evaluation, which incorporates the quantitative uncertainties, would be a more appropriate approach.

This small difference in risk reduction between alternative remedy scenarios is likely due to the driving PRGs being based on background. The risk associated with background levels of COCs should be presented in a side-by-side comparison to the residual risk estimates in order to demonstrate the benefit of the remedial measures to the public. Based on the residual risks presented, any remediation beyond Alternative B (which does show a great degree of risk reduction from Alternative A, no action, than the difference between other alternatives) is unwarranted. The very large increase in costs for minimal and insignificant risk reduction between Alternatives B and I is not recognized in the FS.

In summary, the removal volumes in Alternative I cannot be justified as a cost-effective reduction of risk in comparison to other alternatives. Nor can the use of mixed criteria such as PRGs (and RALs) from different alternatives (i.e., "E" and "F" applied either site-wide or within an SMA) be justified based on differences in risk outcomes that are within an order-of-magnitude.

EPA Position:
See EPA's position to LSS dispute issue 8.

Evraz Dispute Issue 1 - EPA's Feasibility Study improperly imposes more stringent remedial action levels (RALs) in some areas of the site than others.
EPA established a range of RALs based on the distribution of surface sediment contamination. In some areas of the site its preferred alternative (Alternative I) selects "Alternative B+PTW" or Alternative D RALs. However, in other areas of the site, including adjacent to EVRAZ's Rivergate mill, Alternative I selects "Alternative E" RALs. This leaves higher concentrations of PAHs and dioxins in some portions of the river. There is nothing in the FS that describes why, if the "Alternative B +PTW" or Alternative D RALs are protective in some portions of the river, they are not equally protective in other areas. One specific example where the use of Alternative E RALs drives remedial action to a lower concentration than other areas is the remedial footprint near outfall OF53A. It is unclear why additional risk reduction is necessary at this location. For dioxin, sufficient data is not available to support such a decision. EVRAZ believes the FS is flawed in applying different levels of protectiveness, and that its site should similarly be remediated to "Alternative B+PTW" RALs.

EPA Position:
The SDU specific evaluations for each of the alternatives provides the evaluation of each alternative in various portions of the river (see Section 4 of the 2016 FS). Based on evaluation of how each alternative performed in achieving interim goals and PRGs, some areas achieved those goals in some alternatives, while they were not achieved in other areas. This is due to the variability in the contaminant releases to the Site and the distribution of contamination in sediments in various portions of the Site. However, EPA is applying the same levels of protectiveness everywhere consistently throughout the Site – the interim goals and PRGs are consistent. What is different is the concentration of contamination that needs to be capped or dredged in order to meet those protective levels.

For Alternative I, Alternative E RALs were selected in SDU 2E to address all PTW and achieve interim targets for all RAOs in this area of the Site.

Evraz Dispute Issue 2 - Failure of FS to account for riverbank remedial actions already implemented, with EPA's approval.
The FS is based on inaccurate information in that it ignores that EVRAZ already implemented a riverbank remedial action for its Rivergate property, a remedial action based on a source control decision made by the Oregon Department of Environmental Quality and concurred with by EPA. Assumed riverbank cleanup extents are used in the overall protectiveness determination and without basis.

EPA Position:
See EPA's position to LWG's dispute issue 1q.

Evraz Dispute Issue 3 - Inadequacy of "groundwater plume" conclusions.
In addition to the concerns raised in the main text of the document, EVRAZ disputes the following issues with respect to EPA's description of what it depicts as a "groundwater plume" adjacent to EVRAZ's Rivergate property.
a. For arsenic, this should not be a plume as concentrations in beach groundwater are within the range of or below site background values, do not exceed benthic toxicity criteria and groundwater discharges do not adversely affect the water column.
b. For manganese, this should not be a plume at all because it does not include site-specific hardness for ecological values and the basis for the human health PRG is application of tap water Regional Screening Levels (RSLs) for manganese in groundwater. As explained in the main text of the document, RSLs are not appropriate PRGs for groundwater in these circumstances.
c. The exposure pathway of concern is in the surface water to which the groundwater discharges. Surface water concentrations here meet the surface water PRG for manganese.
d. Groundwater plumes are used in the overall protectiveness evaluation and overestimation of plume extent skews the metrics.

EPA Position:
The 2016 FS identified COCs for groundwater plumes based on information provided by ODEQ. See EPA position to LWG issue 1q.

There has been limited sampling to characterize the nature and extent of the groundwater plumes offshore of the Evraz facility. Further, there have been no source control actions taken at this property to control the groundwater plumes. Contaminants of concern in groundwater are arsenic and manganese based on information provided by ODEQ. **[AR Doc # 1469786 and 1469793]** Thus, these contaminants will be monitored in pore water during remedial design to ensure that the pore water is not impacted such that a reactive layer in a cap or some other upland control may be necessary to ensure PRGs are achieved. The ecological PRGs for manganese were developed based on site-specific hardness values. **[AR Doc # 100005457]**

See EPA position to LWG dispute issue 1d, 1m and 1n.

Gunderson Dispute Issue 1 - Failure to Account for Completed Riverbank Source Control Measures

The FS ignores Gunderson's extensive source control work implemented under the oversight of the Oregon Department of Environmental Quality (DEQ) under Voluntary Cleanup Agreement No. WMCVC-NWR-94-01 and Consent Order No. LQVC-NWR-13-02, and in accordance with the requirements set out in the DEQ-EPA Portland Harbor Joint Source Control Strategy (JSCS; DEQ, 2005). Gunderson has implemented permanent riverbank source control measures at some riverbank areas that are identified by EPA as needing remediation. Gunderson has also completed interim source control measures under DEQ oversight at the remainder of the riverbank areas that are identified by EPA in the FS and agreed with DEQ that additional permanent measures will be implemented concurrent with the adjacent in water remedy.

EPA Position:

See EPA Position to LWG dispute issue 1q.

Gunderson Dispute Issue 2 - "Groundwater Plume" Conclusions Are Inaccurate and Contradictory to Conclusions of the RI

The FS depicts two groundwater plumes (referred to herein as the "Southeast Plume" and the "Northwest Plume") adjacent to Area 1 of the Gunderson facility. Gunderson disputes the following issues with respect to the EPA-depicted groundwater plumes.
a. EPA provides no clear rational for depicting the locations and extents of the plumes at the
Gunderson facility (and elsewhere in the Portland Harbor).
b. During extensive investigations conducted under DEQ oversight, there has never been any evidence that the so-called Southeast Plume exists now, or ever approached anywhere near the river either before or after it was subjected to remediation by sparging.
c. The depiction of the Northwest Plume is contradictory to the conclusions of the EPA approved
RI, "The data suggest that ongoing migration of the chemicals to the TZW via groundwater discharge does not contribute to significant concentrations of COIs in nearshore TZW sediments."
d. The Northwest Plume was delineated because VOC concentrations in near shore TZW exceeded human health screening levels based on the ingestion of Willamette River water. TZW remediation standards based on the consumption of Willamette River water are not appropriate.
e. The contaminants detected in a small area of transition zone water have not been detected in surface water.
f. The December 2007 Round 3 Groundwater Pathway Assessment Field Sampling Report for Stratigraphic Covering – Gunderson, Prepared for the Lower Willamette Group and submitted to EPA by Integral Consulting concluded that "the stratigraphic

information does not indicate a conductive pathway for any remnant TCA plum…. On November 8, 2007, EPA indicated to the LWG Management Team that the agencies concurred that the stratigraphic information did not indicate the need for follow-up TZW sampling."
g. The analytical data that serve as the apparent basis for EPAs delineation of the Northwest
Plume were collected more than ten years ago. VOCs in upland groundwater have exhibited long-term decreasing trends, even prior to active treatment, which began in 2007. Based on these trends and the low residual concentrations of VOCs in groundwater, DEQ authorized deactivation of the groundwater treatment system for this plume in 2014. There is no evidence that it posed any current threat to sediments or porewater.

EPA Position:
Groundwater plumes were identified in the RI Report, Section 4 and Appendix C2 (see Figure 4.4-10a-c, Map 4.4-3a-h, and Table 4.2-2). There has been limited sampling to characterize the nature and extent of the groundwater plumes offshore of the Gunderson property. Further, there have been limited source control actions taken at this property to control the groundwater plumes. Contaminants of concern will be monitored for in remedial design to determine whether the pore water is impacted such that a reactive layer in a cap or some other upland control may be necessary to ensure PRGs are achieved.

See EPA position to LWG dispute issue 1d, 1m and 1n.

NW Natural Dispute Issue
On September 27, 2012, EPA provided a preliminary set of comments on the Gasco EE/CA stating that "any comments provided on the Gasco EE/CA are preliminary as the Gasco EE/CA is so heavily dependent on the Portland Harbor draft FS…. Therefore, comments provided on the Portland Harbor draft FS may also need to be addressed in the Gasco EE/CA." Pursuant to EPA's February 4, 2016 agreement with the Lower Willamette Group, EPA is finalizing the Portland Harbor FS rather than providing comments. Many of the modifications EPA has made in the June 2016 FS are inconsistent with the terms of the Gasco Consent Order and with the information, analyses and conclusions of the Gasco EE/CA.

EPA Position:
The effect of the 2016 FS on the Gasco Consent Order is beyond the scope of this dispute.

NW Natural Dispute Issue 1 - Risk Reduction and Risk Management
In the September 9, 2009 Administrative Settlement and Agreement and Order on Consent for the Gasco Sediments Site (the "Gasco Consent Order"), EPA and NW Natural specifically agreed to use risk management principles and the results of the

harborwide risk assessment to define areas for and approaches to cleanup that are based on significant risk reduction.

"This SOW's goal is to design a remedy consistent with the ROD that will reduce key human and ecological risks cost effectively given Site characteristics, which results in a cleanup that is protective of public health and the environment and meets all federal and state applicable and relevant and appropriate requirements (ARARs). The risk lines of evidence used in the ROD will guide risk management for the Gasco Sediments Site. The design will also use a risk management framework consistent with EPA guidance (EPA 2005 and EPA 1988) on developing sediment remedies and specifically recognizes the risk management goals for the project throughout the evaluation and design process. The risk management related approaches that are specifically important to this project and are consistent with guidance include:
• The Gasco Sediments Site cleanup boundary will be consistent with Portland Harbor EPA approved BLRA.
• Evaluate remedial alternatives with regard to total net risk reduction within the overall framework of the NCP remedy selection criteria.
• Use the Portland Harbor risk assessment protocols, procedures, data, and outcomes whenever possible to set clean up boundaries and evaluate risk reduction, unless use of these would cause an unacceptable delay to the Gasco Sediments Site remediation."57

As more fully described in the LWG's comments on the EPA August 2015 draft FS and the main text of this document, EPA's FS is not consistent with either the approved baseline risk assessments for Portland Harbor or a risk management approach focused on the reduction of key human and ecological risks at the site. In particular, NW Natural objects to EPA's use of TPAH RALs and PRGs, the use of which are inconsistent with the findings of the approved BHHRA and BERA, are technically unsupported, and result in significant mass removal unrelated to any measurable reduction in risk.

cPAH PRGs and RALs (expressed as BaPEq) were developed under EPA oversight for the LWG's March 2012 draft FS and were used in NW Natural's March 2012 draft Engineering Evaluation and Cost Analysis for the Gasco Sediments Site (the "Gasco EE/CA"). BaPEq is consistent with the methods and results of the Portland Harbor BHHRA, which were assessed in terms of total cancer risk from cPAHs on a BaPEq basis. The risk-based approach called for in the guidance6 specifies that RALs should be consistent with the methods and findings of the BLRAs to ensure that sediment remedies are "risk-based" (i.e., result in effective risk reduction).

The EPA June 2016 FS itself is consistent with this and expresses all human health PAH PRGs as BaPEq. Therefore, use of BaPEq RALs clearly allows for a direct comparison on a consistent basis between the RALs and the PRGs. Using TPAH RALs does not allow for a direct relationship between RALs and PRGs. In fact, using a TPAH PEC for protection of benthic exposure is not only inconsistent with the approved BERA but is particularly inappropriate for the Gasco sediments site, where NW Natural has invested considerable effort and expense (under EPA oversight) in evaluating the multiple lines of

evidence approach defined in the Gasco Consent Order as the basis for identifying areas requiring active remediation consistent with the BLRAs.58

NW Natural further objects to the application of TPAH (or BaPEq) RALs within the navigation channel. cPAH risks related to sediment direct contact and shellfish consumption exposures occur only outside the navigation channel (along the shoreline), and as a result, BaPEq RALs associated with these potential risks should be applied in exposure pathway areas only. Although some potentially unacceptable cPAH risk from fish consumption was identified in the BHHRA, EPA was unable to develop any valid relationship between cPAH fish tissue and sediment concentrations at the Site, or any other sediments site, due to the rapid metabolism of PAHs by vertebrate fish.59 Carcinogenic PAHs represent less than 1% of the cumulative risks to people eating fish and are, therefore, not a technically valid reason to significantly expand the remedy on the basis of a technically inappropriate PRG, given that there is no reasonable expectation that such an expansion could have any meaningful impact at all on the overall fish consumption risk. It is critical to note that if the shellfish consumption PRG EPA has proposed to use as a surrogate for fish consumption were applied at the same fish exposure scale as EPA used in the BHHRA (whole river mile rather than one-third transect river mile), all remedial alternatives
(other than no action) evaluated in the Gasco EE/CA would attain the PRG without application of TPAH or BaPEq RALs in the navigation channel.

TPAH or BaPEq RALs can only be linked to effective risk reduction along the shoreline (using the BHHRA findings and the resulting appropriate PRGs for sediment direct contact and shellfish consumption). If inappropriately applied to the navigation channel, where the risk pathway does not exist, the remedy would cost perhaps hundreds of millions of dollars more, yet result in no additional risk reduction. These RALs should therefore only be used only along the shoreline outside of the navigation channel where the exposure pathway is complete. The multiple lines of evidence (LWG Comprehensive Benthic Risk Area) approach outlined in the Gasco Consent Order and consistent with the BERA is appropriate for protection of ecological receptors and NW Natural respectfully requests that it be used by EPA for remedial decisions in that area.

EPA Position:
See EPA position to LWG dispute issue 1d.

NW Natural Dispute Issue 2 - Future Source Material
EPA's identification of "globules or blebs" of NAPL as "source material" constituting "principal threat waste" (PTW) at the Gasco Sediments Site is inconsistent with the more specific definition of "potential future source of risk material" in Section 3.2 (RAO 1) of the
Gasco Consent Order Statement of Work through the delineation of "substantial product."
Section 3.6.2.1 of the Gasco SOW states:

"Areas with substantial presence of product in sediments is a line of evidence related to potential mobility of chemicals in the future, and thus related to risks identified in the BLRA. Visual observations in sediment cores shall be the primary parameter used for this line of evidence. As noted above, the term "substantial" product is intended to 1) target product that is related to potential future mobility and 2) indicate a preference for removal as defined by RAO #1. The definition of substantial product does not include every incidence of product observation at the site."

Section 3.6.2.1 goes on to provide more than a page of detail on the precise physical characteristics of material that EPA will consider sufficiently mobile to constitute source material. Based upon this definition, NW Natural has conducted multiple field investigations at a cost of several million dollars to delineate the location of "substantial product" at the Gasco sediment site. These investigations were used to complete detailed and site-specific remedial alternative evaluations in the Gasco EE/CA.

The June 2016 FS does not explain why EPA has apparently abandoned the more specific and technical definition of "substantial product" in favor of "globules and blebs" or why "globules and blebs" is a superior approach for identifying material that presents a significant source of future risk. In the absence of any technical justification, and given the substantial resources NW Natural has put into complying with EPA's original direction on the identification of potential future source material, EPA's change of course is arbitrary and capricious.

NW Natural respectfully requests that EPA abide by the more specific and technically sound definition of "substantial product" contained in the Gasco Consent Order.

EPA Position:
The NCP and EPA guidance uses the terms "source material" and "principal threat waste", not "substantial product." Any material that is highly mobile as analyzed in the 2016 FS is principal threat waste. It is expected that substantial product as defined in the Gasco order matches up with and is consistent with the highly mobile PTW identified in the 2016 FS. The 2016 FS is being consistent with the NCP and EPA guidance.

NW Natural Dispute Issue 3 - Remediation Waste
EPA's June 2016 FS identifies a category of remediation waste called "Waste or Media Containing Waste that May Warrant Additional Management." EPA states that "Waste with this designation may be specially managed as a non-hazardous waste at a Subtitle C facility based on the exceedance of TCLP criteria for MGP-related constituents and/or special considerations such as worker safety and equipment decontamination. However, if the material is treated and TCLP criteria are no longer exceeded after treatment, it may be disposed of in a RCRA Subtitle D facility."

NW Natural agrees that MGP-related remediation waste that exceeds TCLP criteria at the time it leaves the site will be disposed of as non-hazardous waste at a Subtitle C facility. This material is identified as "Special Waste" under the Gasco Consent Order.

To the extent, however, that EPA's June 2016 FS indicates that it may require MGP-related remediation wastes that do not exceed TCLP criteria to be disposed of at a Subtitle C facility based on other "special considerations," that requirement would be inconsistent with the Gasco Consent Order, which provides

"The method to determine that MGP-related material should be managed as a Special Waste shall be based on the absence of TCE and associated CVOC chemicals and exceedance of TCLP criteria for any MGP-related constituent. If TCLP criteria are exceeded at the time the material leaves the Site, then the material shall be designated Special Waste and transported to a Subtitle C facility. If not, the material would be disposed of as Cleanup Material at a Subtitle D facility [permitted to accept the material].

This method applies to both untreated and post treatment materials, if treatment is proposed. Consequently, an untreated material may meet this definition, but, upon treatment may be determined to no longer meet this definition. In the event that treatment, including treatment in barges, changes the definition, the material would no longer be designated a Special Waste."

The June 2016 FS goes on to state that EPA is assuming "for FS cost purposes" that Gasco remediation wastes identified as PTW "would exceed the TCLP criteria and would need cementbased solidification treatment prior to disposal in a Subtitle C disposal facility."
NW Natural respectfully requests that EPA clarify that, consistent with the Gasco Consent Order (and text earlier in the same paragraph in the June 2016 FS), material that either does not exceed TCLP criteria or that is treated so that TCLP criteria are not exceeded may be disposed of in an appropriately permitted Subtitle D facility.

EPA Position:
EPA's 2016 FS was clear what the assumptions were about disposal of MGP wastes and the need for treatment, and that if TCLP criteria are no longer exceeded after treatment then dredged MGP wastes could be disposed of in a RCRA Subtitle D facility. The 2016 FS page 3-29 stated:

Waste or Media Containing Waste that May Warrant Additional Management

MGP wastes are by definition not RCRA hazardous wastes per 40 CFR §261.24(a), which specifically excludes solid MGP waste. While MGP wastes are exempted as a RCRA hazardous waste, concerns about the toxicity and mobility of the material prompted EPA to classify these materials as a "Waste or Media containing Waste that May Warrant Additional Management" at the Site so the contaminated sediment could be appropriately handled and managed. Waste with this designation may be specially managed as a non-hazardous waste at a Subtitle C facility based on the exceedance of TCLP criteria for MGP-related constituents and/or special considerations such as worker safety and equipment decontamination (USEPA 2004, 2005). **However, if the material**

is treated and TCLP criteria are no longer exceeded after treatment, it may be disposed of in a RCRA Subtitle D facility. It was assumed for FS cost purposes that the MGP waste identified as PTW NAPL/NRC at the Gasco former MGP facility would exceed the TCLP criteria and would need cement-based solidification treatment prior to disposal in a Subtitle C disposal facility. (emphasis added)

NW Natural Dispute Issue 4 - Site-Specific Technology Assignment and Evaluation

The Gasco Consent Order provides for evaluation of "a range of technologies including dredging, capping, and Monitored Natural Recovery (MNR). Alternatives will include combinations of technologies that are tailored to the physical, chemical and other conditions of the Site." By contrast, the EPA June 2016 FS assigns prescriptive technologies based upon generalized decision trees. The EPA alternatives do not allow evaluation of the comparative effectiveness of various combinations of technologies applied within the same area of the site – the only difference among the EPA FS alternatives is the size of a single applied technology.

The combination of technologies that will attain the best balance of risk reduction and cost effectiveness at any specific location is highly site-specific. EPA's remedy selection must allow for technology adjustment and refinement through the incorporation of the types of site- specific information considered in the Gasco EE/CA but not carried forward into EPA's June
2016 FS. EPA has not provided any rationale for its decision not to import the more refined technology evaluations of the Gasco EE/CA into the FS (or into the Proposed Plan, for that matter). EPA should, at a minimum, clarify how technology assignments will be refined and adjusted during remedial design and implementation. The draft capping demonstration decision tree EPA provided to NW Natural in November 2015, for example, would be an appropriate sort of tool to illustrate how EPA intends to make refinements based on site-specific data or other remedial design information. EPA's decision not to incorporate such tools into the June 2016 FS or the Proposed Plan is a major contributor to our inability to understand EPA's vision for how cleanup will actually be designed and implemented, especially if additional data collection leads to a change in our understanding of site conditions.

NW Natural also objects to EPA's decision to assign remedial technologies at Gasco that ignore the documented performance of the upland hydraulic control & containment system installed under Oregon DEQ oversight and in close coordination with EPA. Similarly, the June 2016 FS provide does not discuss or consider the integration of HC&C system performance data in the future during remedial design.

The Gasco Consent Order clearly states that "cleanup alternatives shall be evaluated in the context of upland groundwater source controls, which will be implemented by this time, including [] reviewing groundwater seepage rate reductions as measured or predicted for upland source control performance[; a]pply the most up to date estimates of groundwater seepage rates and chemical concentrations (as measured or extrapolated) for evaluation of attenuation (i.e, MNR), capping, and dredging

alternatives and their long term effectiveness[; and e]valuating attenuation rate predictions for groundwater and TZW that will not be directly remediated by upland source controls." EPA's unexplained retreat from a site-specific, technically sound decision framework that directly accounts for the performance of upland source controls to a generic approach that ignores established fact is arbitrary and inconsistent with the Gasco Consent Order. NW Natural respectfully requests that EPA state that technology assignments can be reevaluated during design in a manner that includes comparative effectiveness using site specific data and procedures consistent with the Gasco Consent Order (as was done in the Gasco EE/CA), including current conditions associated with existing upland groundwater source controls.

EPA Position:

As described in Section 3 of the 2016 FS, technology assignments were made based on environmental and anthropogenic conditions at the Site. The entire Portland Harbor Site (2,167 acres) exceeds PRGs and thus requires action. The four general response actions for consideration in the 2016 FS are capping, dredging, enhanced natural recovery (ENR), and monitored natural recovery (MNR) which is consistent with the technologies listed in the Gasco order. ENR and MNR (per EPA's 2005 Contaminated Sediment guidance) are most appropriately applied to low contaminant concentrations in large diffuse areas since:

- harm to the ecological community due to sediment disturbance may outweigh the risk reduction of an active cleanup
- slow in reducing risks in comparison to active remedies
- includes some risk of reexposure of the contaminants
- the time frame for natural recovery may be slower than that predicted for dredging or in-situ capping
- relies upon institutional controls, such as fish consumption advisories, to control human exposure during the recovery period, which may have limited effectiveness

Therefore, ENR and MNR were assigned to areas not addressed through capping and dredging since the Site will naturally recover once the higher concentration areas are addressed. The 2016 FS did not assign ENR in the main channel since the CSM is that this is a transitional river system where both deposition and erosion occur seasonally. Therefore, any sand placed in this area would be transported downriver and would not enhance the natural recovery in the area where it was placed. EPA identified Swan Island Lagoon as an area where ENR would be applied; however, there may be some opportunities in offshore areas (coves, embayments, slips) where ENR may be used to ensure PRGs are achieved, which can be explored in remedial design. These technology assignments are generally consistent with the LWG 2012 draft FS, although the LWG's 2012 draft FS assigned in-situ treatment within SMAs which EPA determined not be supported by the empirical evidence of the erosive conditions in many areas of the site (see EPA's comments 70 through 74 on the LWG's 2012 draft FS). **[AR Doc # 100007297 through 100007299]**

The navigation channel and future maintenance dredge areas were assigned dredging technology within sediment management areas (SMAs) since these areas are slated to be dredged in the future and therefore placement of a cap would prevent that activity (future dredging) in that area of the Site. This technology assignment is consistent with the LWG 2012 draft FS.

Caps were assigned under structures that would not be removed during remedial action. However, dredging with specialized equipment can be conducted under some types of structures. The decisions to remove a structure, dredge under a structure, or cap design will be made in remedial design.

In the shallow zone (which includes river banks), EPA applied a dredge/cap technology assignment within SMAs based on habitat issues and 404(b)(1) requirements. The amount of dredging and capping and the cap design used in this area is to be determined in remedial design. EPA made reasonable assumptions in the 2016 FS in order to develop a cost estimate.

The assignment of technologies within SMAs in the intermediate zone (the area between the navigation channel/FMD zone and the shallow zone) are discussed in Section 3.4.6 and Appendix C of the 2016 FS. Factors evaluated included current and reasonably anticipated future land and waterway use, areas of erosion/deposition, sediment bed slope, infrastructure such as docks and piers, and physical sediment characteristics. If both capping and dredging technologies were both found to work in a particular area of the Site, EPA applied the capping technology.

In-situ treatment was included as components of ENR, capping and dredge residual management in various areas of the river to address contaminated groundwater plumes and principal threat waste remaining in the river. Ex-situ treatment was also assumed as a component of disposing of certain dredge material. Several assumptions were made to develop costs in the FS regarding in-situ and ex-situ treatment of material for cost purposes, but the application and extent of treatment will be determined in remedial design.

Therefore, EPA did evaluate all available technologies to specific areas in development of the alternatives and selected the appropriate technology to use based on site-specific environmental and anthropogenic conditions. EPA’s 2005 Contaminated Sediment guidance acknowledges that alternatives are combinations of technologies since single technologies do not work in a large complex river system with varied uses. [2016 FS, Section 3.1.1]

The decision trees in the 2016 FS merely presented these decisions and the assumptions used to develop the cost estimates and are not meant to imply prescriptive actions to be carried out in remedy implementation.

TOC Holdings Dispute Issue 1

The June 2016 FS neglects to include a discussion of upland source controls that have been implemented and the performance of those source controls in the remedial evaluations. The Time Oil groundwater plume identified in section 1.2.3.4 is fully controlled and meets JSCS values for all constituents other than potentially arsenic, which does not appear to be associated with site-related groundwater contamination.

EPA Position:

The purpose of the FS is to develop and evaluate remedial alternatives for the in-river portion of the Portland Harbor site. EPA is not making a cleanup decision on upland sources and therefore it was appropriate that the 2016 FS did not evaluate or discuss specifics about source control measures that have been taken. Prior to implementing the cleanup, the effectiveness of relevant source control actions will be evaluated to minimize the risk of recontamination. The 2016 FS assumed that all sources were controlled in evaluating and comparing the remedial alternatives' performance to each other. However, the 2016 FS acknowledges that there are some areas where the contamination (usually groundwater and subsurface sediment) extends beyond the point of upland control in which a reactive layer may be needed to ensure that PRGs will be attained in pore water. If PRGs are already attained, then a reactive layer will not be necessary. The 2016 FS identifies where known groundwater plumes throughout the Site are located and the contaminants of concern so that in remedial design focused pore water sampling can be conducted to determine the appropriate cap design or residual management layer to employ.

TOC Holdings Dispute Issue 2

EPA's application of E RALs in some but not all parts of SDU 3.5E results in the identification of a Sediment Management Area for PeCDD where the current SDU 3.5 SWAC already meets the most conservative PeCDD PRG of 0.0002 ppb for RAO2 (fish consumption on a river mile basis).71 Therefore, no sediment remedy is necessary to achieve RAO2 in the relevant exposure area.

EPA Position:

The RALs are applied to all parts of the Site and therefore all parts of SDU 3.5E. The RALs for an alternative are used in combination, not individually, to delineate areas to apply the remedial technologies of capping and dredging. If a contaminant concentration for one of the RALs is not exceeded in a particular part of the river, then that RAL is not applied. RALs are applied on a point-by-point basis, but evaluations of the effectiveness of the RAL achieving PRGs is conducted on broader spatial scales consistent with the baseline risk assessments. The evaluation is made on all contaminants posing risk, not individually.

Respondent is correct that the most conservative sediment PRG for 1,2,3,7,8-PeCDD is 0.0002 µg/kg for RAO 2. In review of Figure 3.4-10, which presents the 1,2,3,7,8-PeCDD RAL contours, the same RAL is used for Alternatives D, E, F and G of 0.0008 µg/kg, which is only a factor of 4 greater than the PRG. The pre-remedial SWAC in SDU

3.5E for 1,2,3,7,8-PeCDD is 0.00025 µg/kg (Alternative A) and the post remedial SWAC for Alternative E is 0.000048 µg/kg (see Table J2.3-7). Since the pre-remedial SWAC is greater than the PRG, a sediment remedy is necessary to achieve RAO 2 in the relevant exposure area. Further, the evaluation in the 2016 FS is based on a limited number of samples (19 sample locations) and additional sampling would need to be conducted to determine the extent of the contamination. A decision in remedial design based on additional sampling will have to be made as to whether or not the area warrants action.

UPRR Dispute Issue

The FS preferred alternative identifies two areas of sediments between RM 10 and 11 that EPA has identified for cleanup, purportedly due to exceedances of the PCB remedial action level ("RAL"). EPA also identified these areas on Figure 3.2-3 as containing principal threat waste. This area of the Site is near Union Pacific's railyard at Albina Yard. Union Pacific disputes this determination, particularly the area from approximately RM 10.7 to RM 11 where there are no exceedances of the applicable RAL in surface or subsurface samples of sediments.

EPA's potential cleanup area near RM 10.7 appears to be based on a PCB exceedance in soil at one location on a 900-foot stretch of the riverbank. EPA included riverbanks as part of its draft FS evaluation of alternatives, but did not identify Albina Yard as a site with "known contaminated riverbank" in section 1.2.3.5 of the FS.

Moreover, in its Final Remedial Investigation/Source Control Measures Evaluation Report for Albina Yard dated November 2010, which was reviewed and approved by Oregon DEQ, Union Pacific determined that the riverbank near Albina Yard had a low potential for erosion because it was highly vegetated and stabilized with rock/rip rap. Because PCB concentrations in the sediments are below the applicable RAL, and the riverbank is stable, this area of sediments should not be included as a potential cleanup area. Certainly, the FS contains no explanation for this area's inclusion as a potential cleanup area, much less as an area containing principal threat waste.

EPA Position:

See EPA's position to UPRR's dispute issue 6.

III. LSS, Inc. (on behalf of Arkema, Inc.) DISPUTE STATEMENT RESPONSE

LSS Dispute Issue 1 - Inadequate Conceptual Site Model

EPA's inadequate conceptual site model (CSM) does not provide an adequate foundation for a thoughtful comparative evaluation of alternatives. The FS does not sufficiently describe the relevant site features, baseline risks, sources, chemical fate and transport, site uses, and other important factors necessary to understand the potential cost effectiveness of EPA's remedial alternatives. Information on contaminant fate and transport is not provided in EPA's CSM discussion. In addition, the site has been characterized by EPA based on aggregated sediment data (i.e., sediment data collected over more than a decade) without regard to time-dependent changes operating in this

system. It is not possible to effectively evaluate remedial alternatives without a robust CSM of the site.

Some examples of specific technical issues with the CSM presented in EPA's FS report include the following:

Aggregating sediment data from the late 1990s through 2007 for the purpose of performing a sediment surface characterization. This is a fatal flaw in EPA's analysis as it prevents any signal of dynamic conditions from being observed; this is also an essential component of monitored natural recovery (MNR) that EPA has included as an important element of every alternative.

EPA Position:
See EPA's position to LWG's dispute issue 1d and 2a.

Assuming without evidence, and ignoring subsequent evidence to the contrary (including 2012 fish tissue, 2013 sediment profile imaging [SPI] data and 2014 sediment data) that the sediment surface conditions at this site are at steady state. The Portland Harbor site is clearly a dynamic system. This is a fatal flaw in the CSM.

EPA Position:
The CSM in the RI Report produced by the LWG and approved by EPA describes the lower Willamette River as a dynamic river system (see Portland Harbor RI, Sections 3 and 10). EPA's assumption was that the Site is in dynamic equilibrium, not steady state. EPA did consider the 2012 fish tissue data as a line of evidence for MNR (see 2016 FS Section 3.6.1.3). EPA only considered data collected under EPA approved work plans; the 2013 sediment profile imaging [SPI] data and 2014 sediment data were not collected under an EPA approved work plan.

Ignoring subsurface conditions where geochemistry and microbiology are key parameters associated with the natural recovery of several constituents for which EPA deems remediation a requirement. We know many areas of this site are under reducing conditions based on the presence of methane in cores. Reductive dehalogenation is a known pathway for natural recovery for some chlorinated compounds. In situ processes of natural recovery should have been addressed in the CSM and the FS. This is particularly important as a consideration for active remediation areas determined by EPA to be located landward of the pier-head line at the Portland Harbor site.

EPA Position:
EPA used the data collected by the LWG to draft the 2016 FS. The LWG did not evaluate groundwater plumes at the Site. As stated in the 2016 FS, the extent of groundwater plumes discharging to the river is currently unknown. Further, the effects of source control on groundwater plumes is unknown because EPA has not been provided any performance data. Information regarding the extent and degredation of groundwater

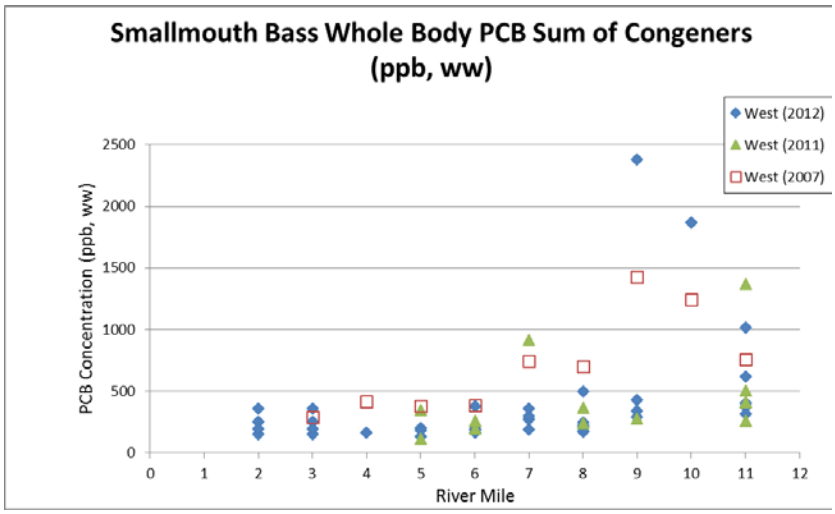
plumes in the river will be considered in remedial design to ensure that adequate caps are placed in the river to deal with residual groundwater plumes, where necessary.

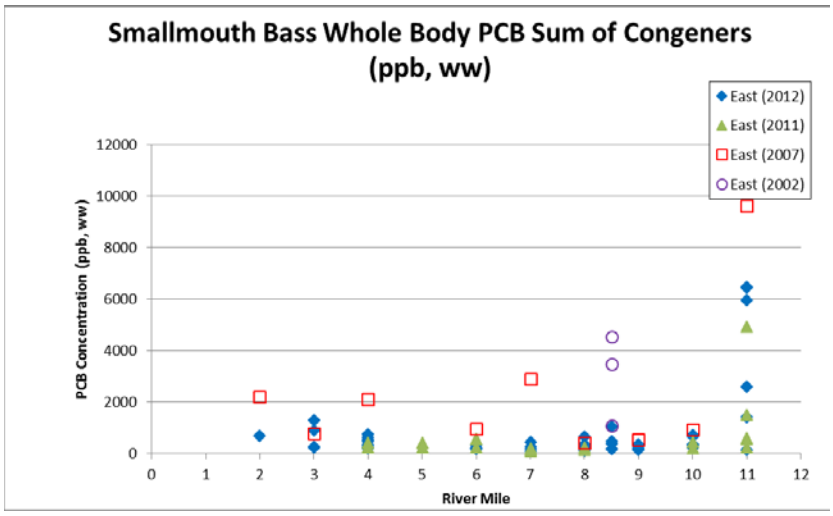
It is unclear if the sitewide total PCB spatially weighted average concentration (SWAC) values presented in EPA's FS included the RM 11.2 information acquired during the Supplemental RI performed in Segment 1 (River miles 9 to 11.7). This creates a significant problem in the comparison of subsequent surface SWACs because it suggests site conditions at the time of the RI were actually cleaner than they were. This makes the demonstration of significant sitewide natural recovery more difficult and inaccurate.

EPA Position:
The 2016 FS clearly states in Section 1.3 that the data collected by the RM 11E Group were not included in the FS database. EPA reviewed the data prior to making the decision not to include in the database (although it is in the administrative record because EPA considered it) and determined that it would not significantly change the remedial footprints. EPA is unclear why the Respondent believes that the omission of this data would result in a significantly different SWAC since the data were collected to supplement the RI/FS data, not to recharacterize this area of the Site. EPA did not look at natural recovery Site-wide as the river dynamics are not consistent throughout the Site. EPA looked at natural recovery on a smaller spatial scale as discussed in Appendix D8 of the 2016 FS.

The use of highly uncertain SWAC values (in some cases the SWAC values varied by an order of magnitude) in localized segments of the site to establish predicted tissue concentrations. This indicates a significant scale effect associated with the surface data used to support the CSM that indicate a lack of characterization in "extent" in the near field of EPA's CSM.

EPA Position:
The variation in the SWAC values in localized segments of the Site does not mean that the SWAC values are highly uncertain. It has to do with the variability in the sediment data and translates into the variability in the fish data. The smallmouth bass data collected in 2007, 2011 and 2012 all show that fish concentrations vary throughout the Site, as can be seen by the plots of the data in the following two figures.





Evaluating the SWACs on this spatial scale (1 RM) reflects the home range of the fish; thus, accurately predicts the exposure to the fish species from contamination in those areas of the Site, and are more representative of the effects of the cleanup in those areas.

A flawed approach was used for calculating site background concentrations (see dispute issue 11 below).

<u>EPA Position:</u>
See EPA's position to LSS's dispute issue 11, below.

A robust surface sediment data set that is representative of current conditions is critical for setting up initial conditions for the alternatives evaluated in the FS. EPA's FS uses aggregated sediment data from 1997 through 2007 for the surface sediment characterization. When these outdated data are used to define surface sediment concentrations at the site, it shifts the "knee of the curve" for comparing alternatives away from the alternatives with less active remediation (B, C, and D) and toward

alternatives with more active remediation (E, F, G, and I). Graphs of PCB sitewide SWAC versus duration for EPA's FS SWAC (84 µg/kg) and the SWAC based on the recent 2014 sediment data (40 µg/kg) are presented in Exhibit 1. CSM errors and omissions need to be corrected to properly understand the source, distribution, fate, and transport of site COCs and to accurately assess and weigh the differences between remedial alternatives.

EPA Position:
EPA used a robust data set provided by the LWG under EPA oversight to develop the alternatives in the 2016 FS. The data set includes 2,293 surface sediment samples collected during the RI to characterize the baseline of the Site. The 2014 data set was not collected under an EPA approved work plan and the validity of the data is uncertain. Further, the 2014 data set is based on merely 98 samples, which is not comparable to the FS data set and can be misleading. [See pages 6 and 7 in **AR Doc ID # 100033508**.] As can be seen from these figures, the data collected in 2014 does not represent the distribution of contamination in the Site and development of RAL curves using that data apportion low level concentrations to large areas of the Site that are have greater concentrations. EPA does not believe there are any errors or omissions in the CSM and that the information used in the 2016 FS is sufficient to develop and select a remedial alternative. EPA acknowledges that additional baseline sampling will be needed during remedial design to implement the remedy and apply the decision tree.

LSS Dispute Issue 2 - Principal Threat Waste Adjacent to the Arkema Site
EPA inappropriately identifies chemicals in sediment adjacent to the Arkema Site as PTW based on either a "source material," "not reliable contained," or "highly toxic criterion. As expanded upon below, source material has never been identified in Arkema Site sediment; EPA should not identify chemicals that can be reliably contained as PTW; and chemicals that require long-term exposure durations through indirect exposoure pathways (i.e., consumption of fish tissue) should not be identified as "highly toxic." In addition, the blanket identification of large areas with low concentrations of chemicals in sediments as PTW is neither required by the National Contingency Plan (NCP) nor necessary to protect public health or the environment.

EPA errs when it misidentifies source material in the FS based on "globules or blebs of product in surface and subsurface sediments…." and when it states "NAPL observed in sediment cores offshore of Arkema contains chlorobenzene and DDT (dissolved)." Arkema/LSS disputes the presence of NAPL globules and blebs related to the site or historical site operations (i.e., sheens related to oils and other uses of the river by ships and other vessels are not related to Arkema and would not contain Arkema contaminants such as MCB). Arkema/LSS responded to CDM Smith's 2013 memorandum (Exhibit 2) that purports to identify NAPL at the Arkema site. To resolve the issue, Arkema prepared a work plan in response to EPA requests under the EE/CA Administrative Order on Consent (AOC) to yet again confirm that NAPL was not present in sediment adjacent to the Arkema site (Integral 2016, Exhibit 3). In addition, no samples of NAPL offshore of Arkema have identified an MCB NAPL. There is no data that supports EPA's statement

that NAPL observed in Arkema sediment "…contains chlorobenzene….". Significantly, a document titled "Top 10 State Issues for Proposed Plan" obtained from the LWG's Freedom of Information Act (FOIA) request identified that based on Oregon DEQ's review of the data "The multiple phases of sediment investigation have not encountered sediment exhibiting NAPL saturated conditions that would warrant thermal treatment prior to management." The status column for the same issue states that "EPA agreed to not assume NAPL at Arkema for the purposes of the cost estimate" (Exhibit 4). Based on these records, we conclude that EPA and DEQ agreed that there was no MCB NAPL in offshore sediments, and therefore the assertion that such sediments represent PTW Source Material as defined by EPA's PTW fact sheet is without foundation, acceptance, or support.

EPA erred when it identified an extensive area of groundwater containing MCB DNAPL discharging to the river as "not reliable contained" (Exhibit 5). First, there is no documented MCB DNAPL groundwater plume to the extent shown in EPA's Figure 3.2-4, adjacent to the Arkema site. The nature and extent of MCB DNAPL in groundwater or sediment porewater as shown in this figure is not based on any current site data. Second, groundwater SCMs have been implemented at the site beginning in 2012, including an upland groundwater barrier wall and extraction and treatment system. The groundwater pathway to the river from upland areas that have MCB in groundwater has been cut off and continment has been in existence for 4 years, and therefore, there is no ongoing source of dissolved phase MCB to the sediment adjacent to the Arkema site. There is no scientific evidence that supports the existence of an ongoing source of MCB DNAPL to the sediment adjacent to the Arkema Site. Groundwater and porewater sampling conducted after the implementation of the SCM has not identified a MCB DNAPL source to sediment adjacent to the Arkema Site. The site characterization error which postulates an extensive area of chlorobenzene DNAPL in sediment at the Arkema Site biases the assessment and comparison of the effectiveness of alternatives as evidenced from the following text: "Alternative D has less capped area (71 acres), but does not reliably contain all PTW remaining in the river." (USEPA 2016, p. ES-15). Without an accurate assessment of NAPL, PTW and PTW areas, EPA's alternatives evaluation is highly inaccurate.

EPA errs when it misidentifies the remaining areas of the Arkema site (including areas upstream and downstream of Arkema; Exhibit 5) as containing "highly toxic" PTW based on surface sediment concentrations for DDx, 2,3,7,8-TCDD, 2,3,7,8-TCDF, 1,2,3,7,8-PeCDD, 2,3,4,7,8-PeCDF, and 1,2,3,4,6,7,8-HxCDF that exceed a 10-3 excess cancer risk level for fish consumption based on the fish ingestion risks from the baseline human health risk assessment (BHHRA). This definition of highly toxic based on a long-term (30 year) exposure to a chemical substance via a fish consumption pathway is not the intent of EPA's PTW fact sheet. These 10-3 risk levels include long-term exposure parameters and indirect exposure based on a 30-year subsistence fish consumption scenario, which does not meet the definition of highly toxic (i.e., toxic under a direct contact or acute exposure scenario). Highly toxic levels should be based on direct

exposure conditions only. Furthermore, the 10-3 excess cancer risk is only a suggested basis and is not prescriptive.

The EPA's proposed highly toxic PTW levels should also be considered in a broader context. EPA's highly toxic PTW values for some constituents are well below cleanup levels and screening level for unrestricted use established for other sites and scenarios. For example, the PCB PTW value of 200 µg/kg is below cleanup goals for many other CERCLA sites, which are at or above 200 µg/kg, typically in the 1,000 µg/kg range. The EPA regional screening level (RSL) for residential soil in fact is 249 µg/kg; in other words, soil with PTW levels specified in the FS could be used as clean fill at homes, schools, and day care facilities. In this context it does not make sound technical or risk management sense for the PTW level to be set at 200 µg/kg. An approach more consistent with the intent of EPA's PTW guidance would be to set the PTW level at a 10-3 risk value based on direct contact to sediment (removal action objective 1 [RAO1]); that would be the lower of the 10-3 risk level (370,000 µg/kg), the hazard quotient (HQ) of 10 (147,600 µg/kg) (as stated in the guidance), or for the PCB case, the TSCA waste threshold (50,000 µg/kg). The use of the TSCA threshold for PCBs is also consistent with decisions at other CERCLA sites. A similar approach should be taken for the other constituents for which highly toxic PTW has been identified, especially dioxins/furans for which the PTW level in the FS is less than 3 times the EPA-recommended preliminary remediation goals PRG for dioxins/furans (once toxicity equivalence factors (TEFs) are applied). LSS belives that application of the revised and readily accepted PTW standards for not reliable contained or highly toxic material will result in none of the sediment at the Arkema site being identified as PTW.

EPA Position:
LSS makes two main points on this issue: (1) "EPA should not identify. . . chemicals that require long-term exposure durations through indirect exposure pathways (i.e., consumption of fish tissue) . . . as "highly toxic" and (2) that there is no NAPL in the river adjacent to its facility.
On the first point, LSS provides no statutory or regulatory support for its position of what can or cannot be principal threat waste.

The NCP [40 CFR 300.430(a)(1)(iii)] states:

(iii) Expectations. EPA generally shall consider the following expectations in developing appropriate remedial alternatives:

(A) EPA expects to use treatment to address the principal threats posed by a site, wherever practicable. Principal threats for which treatment is most likely to be appropriate include liquids, areas contaminated with high concentrations of toxic compounds, and highly mobile materials…

The NCP does not say that principal threats at a site can't relate to contaminants posing a bioaccumulative risk. Identification of principal threats is a site-specific determination.

EPA's *A Guide to Principal Threat and Low Level Threat Wastes* (1991) indicates that the NCP principal threat expectation reflects the belief that certain source materials should be treated given the long-term unreliability to contain them or the serious consequences of exposure if a release were to occur. Source material is defined as material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to ground water, to **surface water,** to air, or acts as a source for direct exposure. (emphasis added) Identifying principal and low-level threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner and/or would present a significant risk to human health or the environment should exposure occur. Conversely, low-level threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied. EPA agrees that the NCP does not mandate a classification of wastes at a site.

However, EPA disagrees that the entire Portland Harbor site represents large areas with low concentrations of chemicals in sediments. The presence of liquid wastes such as NAPL, mobile source materials that are not readily contained, and contaminants that are highly toxic to sensitive populations are strong indicators of wastes that would be consistent with EPA's *A Guide to Principal Threat and Low Level Threat Wastes* as being identified as PTW. Likewise, the setting of the release of hazardous substances and the exposures that are likely to occur at a particular site is relevant to identifying principal threats. LSS's claims that the PCB PTW levels could be used as fill in a residential setting is totally irrelevant to this FS, which was analyzing cleanup alternatives for addressing contaminated sediment and surface water to protect the in-river receptors. Significant risks to wildlife and people, particularly, infants and children who eat or whose mothers eat resident fish from the site has been documented. Stating where the contaminated sediment could go or be placed and not be presenting a risk is irrelevant to the issue of what is principal threat waste in the lower Willamette River.

The identification of PTW at the Portland Harbor site is consistent with the NCP and EPA guidance. EPA's *A Guide to Principal Threat and Low Level Threat Wastes* further clarifies that principal threat wastes are "those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur." The guidance goes on to state that "no 'threshold level' of toxicity/risk has been established to equate to 'principal threat.' However, where toxicity and mobility of source material combine to pose a potential risk of 10^{-3} or greater, generally treatment alternatives should be evaluated." EPA's guidance does not distinguish between risks due to indirect exposure associated with fish consumption and direct contact exposure. As a result, EPA's definition of highly toxic PTW is considered consistent with the NCP and EPA guidance.

TSCA is not a factor for PTW identification. LSS indicates that the use of the TSCA threshold for PCBs is consistent with decisions at other CERCLA sites; however, the sites are not identified in the comment, and therefore, it is not clear whether the use of TSCA at the referenced "other CERCLA sites" was for identification of PTW or for other purposes such as a cleanup level or offsite disposal requirements.

EPA's *A Guide to Principal Threat and Low Level Threat Wastes* states that "no 'threshold level' of toxicity/risk has been established to equate to 'principal threat.' The classification threshold value for PTW is based on site-specific circumstances. Consistent with the NCP and EPA's PTW guidance and site-specific conditions, PTW has been identified based on a 10^{-3} cancer risk (highly toxic) or NAPL within the sediment bed (source material) and on an evaluation of mobility of contaminants in the sediment.

LSS's second point is whether NAPL exists at its facility. EPA disagrees with LSS' assertion there is no evidence PTW as defined by EPA's PTW fact sheet exists adjacent to its facility is without foundation, acceptance, or support. As noted in the comment, EPA has identified the presence of NAPL offshore of the Arkema site based on physical observations and other information indicating the presence of NAPL. Chlorobenzene is used in the DDT manufacturing process and the largest amount of chlorobenzene DNAPL is present under and around the manufacturing process residue (MPR) pond in the Acid Plant Area. This indicates that liquid chlorobenzene may have been discharged directly to the MPR pond along with other process residues. DDT is produced by combining chlorobenzene with trichloroacetaldehyde and an excess of chlorobenzene is essential to the reaction, which leads to considerable amounts of unreacted chlorobenzene being generated as a by-product with the DDT (Curtin, 1953). This means it is likely that large amounts of chlorobenzene were being discharged as liquid waste, a hypothesis that is supported by the information in the 2005 RI Report. The horizontal and vertical extent of chlorobenzene NAPL within the upland is also well documented in the 2005 RI report. Sediments and groundwater in the vicinity of Docks 1 and 2 have also been affected by the migration of the NAPL plume at the upland MPR pond and have high dissolved concentrations of chlorobenzene. Six sediment cores were indicative of the presence of NAPL based on field screening but none of these were conclusively identified as chlorobenzene NAPL. **[AR Doc # 686965]**

Qualitatively, soils with chlorobenzene concentrations greater than 10,000 mg/kg would indicate the presence of NAPL, however NAPL may also be present at lower concentrations (Feenstra et al. 1991). The highest chlorobenzene soil concentration identified in the Arkema RI is 43,000 mg/kg so the presence of chlorobenzene NAPL can be expected. Typically, dissolved concentrations greater than 1 percent of the aqueous solubility limit are suggestive of NAPL presence; however, concentrations less than 1 percent are not necessarily indicative of NAPL absence (Cohen et al. 1992; USEPA 1992a,b). The maximum in-water groundwater concentration and sediment porewater/transition zone water (TZW) concentration of chlorobenzene measured in the vicinity of Docks 1 and 2 is 64 mg/L and 30 mg/L, respectively. Both TZW and in-water groundwater concentrations are greater than 1 percent of chlorobenzene's solubility of

500 mg/L (i.e., greater than 5 mg/L). The results do not show extensive visual evidence of chlorobenzene NAPL present in groundwater and sediment porewater; however, the dissolved chlorobenzene concentrations are deemed indicative of the presence of residual chlorobenzene NAPL in the vicinity of Docks 1 and 2 (CDM Smith 2013).

Core logs from sediment borings installed offshore of the Arkema site were evaluated to determine whether visual observations of blebs, globules, dark brown oily material, or other terms indicating presence of product were present. Other lines of evidence evaluated included sheens and odors along with corresponding elevated organic vapor meter (OVM) readings, transition zone water (TZW) and offshore groundwater concentrations at levels exceeding 1% of solubility, and the documented presence of dense non-aqueous phase liquid (DNAPL) in upland soils. These lines of evidence clearly indicate that NAPL may be present offshore of the Arkema site.

EPA acknowledges statements by ODEQ that multiple phases of sediment investigation have not encountered sediment exhibiting NAPL saturated conditions that would warrant thermal treatment prior to management and that the most significant observations have been the occasional sheen and product bleb. However, ODEQ also notes that it is possible that RD/RA activities could encounter a pocket of heavily NAPL impacted sediment and recommends that EPA adaptively manage these potential circumstances rather than ascribe a large treatment cost associated with these sediments to the Portland Harbor remedy. **[AR Doc ID # 100019939]** To estimate the potential treatment costs that may be associated with mobile PTW offshore of the Arkema facility in the 2016 FS, EPA applied no treatment to one-third of this material, solidification/stabilization to one-third of this material, and thermal treatment to one-third of this material. EPA has not made any decisions or requirements for treatment of this material at this time; this decision will be made in remedial design phase of the project.

Based on existing information, the 2016 FS assumes some pesticide/chlorobenzene PTW wastes will need to be dredged and disposed of off-site at the Area 7W SDU; however, it also assumes that not all contaminated sediment generated during dredging or capped in situ at the Area 7W SDU will require treatment. Remedial design sampling will need to further refine the waste characterization along with the identification of PTW at this area of the site; final dredge and capping footprints; and what treatment for off-site disposal may be required.

The EPA disagrees with the statement that it erred in identifying an extensive area of groundwater containing MCB DNAPL discharging to the river as “not reliable (sic) contained” (Exhibit 5). First, the figure referenced in Exhibit 5 does not show, nor intends to show a groundwater plume. The figure referred to in the comment, Figure 3.2-4 in the 2016 FS, presents an FS level understanding of the extent of contaminants within the river. This extent is based on limited remedial investigation sampling that bounds contaminant concentrations meeting PTW thresholds. The EPA anticipates additional, more extensive site data will be collected during the remedial design phase to refine this FS level characterization. Second, the assertion made in this comment that SCMs have

"cut off" and contained the groundwater pathway to the river from upland areas that have, or could potentially have MCB in groundwater, is not supported by any data, or information provided in the comment. Without this information, the comment assertions are speculative.

The EPA's current understanding of the groundwater extraction and treatment system referenced in the comment is that there have been performance issues with the treatment system and biofouling of the extraction wells to the point that a Corrective Action Plan has been submitted at DEQ's request (ERM West, Inc., 2016) providing a path forward to bring the system into compliance to meet its operational capture and treatment objectives so that DEQ and EPA can complete their evaluation of the operations effectiveness in cutting off and containing any potential ongoing source of dissolved phase contaminants discharging to the in-river sediment adjacent to the Arkema site. Further, the comment implies EPA's alternatives evaluation is highly inaccurate without an accurate assessment of NAPL, PTW and PTW areas and quotes a sentence out of the 2016 FS Executive Summary to prove its point. EPA contends that appropriate FS level alternative assessment information is found within the body of the document and not exclusive to text within the Executive Summary. That said, it is unclear what specifically is inaccurate about the summary statement pulled from the executive summary. The 2016 FS presents an assessment of the extent of NAPL, PTW and PTW areas based on the RI data. Using this information and honoring the context of the Executive Summary statement, there is nothing inaccurate in the statement that "Alternative D has less capped area (71 acres), but does not reliably contain all PTW remaining in the river".

LSS Dispute Issue 3 - Inappropriate waste designation for sediments adjacent to the Arkema site

The assumed areas for disposal of sediment as RCRA waste (Figure 3.4-35, Exhibit 6) are based on a single toxicity characteristic leaching procedure (TCLP) sample for lead1 and no TCLP samples for chromium. Based on sediment analytical results, the area shown on Figure 3.4-35 does not represent sediment that will require RCRA Subtitle C landfill disposal. The State-listed pesticide residue designation also does not necessarily apply to sediment at the Arkema Site (Figure 3.4-36, Exhibit 6). As recently as February 2016 DEQ was researching the issue of whether sediment near Arkema would be designated a State-listed pesticide waste. Item 3 of the "Top 10 State Issues for Proposed Plan" document obtained from the LWG's FOIA request (Exhibit 4) states that "Sean needs State determination of State-only pesticide question, which Matt is researching." However, even if it is determined that some portion of the sediment is a State-listed pesticide residue waste, it would not preclude the placement of this sediment in a CDF (see HWIR discussion below) or disposal in a Subtitle D landfill out of state. When a State-listed hazardous waste is transported out of state (i.e., the Roosevelt Regional landfill presented in the FS), the Oregon State waste designation no longer applies, and the waste can be disposed as a non-hazardous waste so long as it meets other landfill disposal criteria. This waste disposal process was recently demonstrated by the disposal of soil from the Arkema Stormwater and Groundwater SCMs, which was disposed of at Roosevelt landfill in Washington.

1 The analytical results minimally exceeded TCLP regulatory limits for lead in this sample. LSS notes that the TCLP samples were collected from specific intervals from single boreholes and were not necessarily representative of the general area around these boreholes. As perhaps a more appropriate approximation representative of bulk sediments, drummed sediments that contained the referenced sample intervals were re-sampled and analyzed for TCLP to evaluate the disposal options for these sediments, and none of those re-sampled drums exceeded the TCLP concentrations.

EPA Position:
EPA made assumptions in the 2016 FS regarding waste disposal to develop a cost estimate. The State did not provide EPA with any definitive information on state listed waste designation, therefore, EPA did not assume that all waste removed offshore of the Arkema would be required to go to a Subtitle C landfill, only the portion that was identified as NAPL-NRC. As EPA clearly states in the 2016 FS, the ultimate disposal requirements will be set by the disposal facility after adequate characterization is accomplished and a disposal facility identified.

Arkema disagrees with the cost assumption that "cement solidification/stabilization, low temperature thermal desorption, and no treatment will be used in equal proportions to treat pesticide/chlorobenzene PTW" for the disposal of dredged sediment that meets EPA's PTW criteria from the Arkema site. Not withstanding the fact that there are no PTW sediments currently identified off the Arkema Site, the FS fails to clearly outline the basis for EPA's assumptions regarding treatment as a prerequisite for offsite disposal. Section 3.2.2.3 makes vague references to regulatory "standards" and "requirements;" however, it fails to clearly identify specific regulations and the conditions under which they are assumed to apply, or not apply, to sediments that are designated as PTW and the mechanism under which they derive need for treatment prior to offsite disposal. Furthermore, the "Top 10 State Issues for Proposed Plan" document obtained from the LWG's FOIA request (Exhibit 4) states that "DEQ wants to be clear that land disposal of these sediments does not require treatment under Oregon Administrative Rules." As presented, EPA has arbitrarily made more conservative assumptions for disposal of PTW defined by sediments containing DDx and NAPL than it has for PCBs, dioxin/furans, and PAHs. LSS believes that based on current data, none of the sediment at the Arkema site should be classified or handled as a Federal- or State-listed hazardous waste.

EPA Position:
PTW has a statutory preference for treatment. EPA expects to use "treatment to address the principal threats posed by a site, whenever practicable" and "engineering controls, such as containment, for waste that poses a relatively low long-term threat." [40 CFR Section 300.430(a)(1)(iii).] EPA identified potential PTW offshore of the Arkema Site (see Figure 3.2-4). Since it is currently unknown what, if any, treatment requirements will be necessary for disposal of removed waste offshore of the Arkema facility, EPA used a range of options to base the 2016 FS costs. The actual costs and requirements will not be

determined until remedial design or after removal and characterization of the waste and identification of the actual disposal facility.

LSS Dispute Issue 4 - Inappropriate Application of the Hazardous Waste Identification Requirements (HWIR) Rule for Disposal of Sediment in a CDF

EPA's FS asserts that Dredged material subject to requirements of a permit that has been issued under Section 404 of the CWA is excluded from the definition of hazardous waste (40 CFR 261.4(g)). This provision is discussed in the Hazardous Waste Identification Rule (HWIR) (63 Federal Register [FR] 65874, 65921; November 30, 1998). Oregon State adopted the HWIR rule in 2003. This rule means that RCRA regulatory requirements do not apply to sediment dredged at the Site and disposed of on-site, such as at the Terminal 4 CDF, if the material otherwise meets the CDF acceptance criteria. (emphasis added)

EPA has correctly stated that RCRA regulatory requirements, including the designation of waste sediment as either a Federal or State-only hazardous waste, do not apply to sediment placed in a CDF; however, the statement mischaracterizes the CWA requirement that the sediment must meet CDF acceptance criteria for this rule to apply. This is simply not the case. Because DEQ has adopted the federal HWIR-media rule, and the CDF would meet CWA Section 404 requirements, RCRA Subtitle C requirements would not apply, and the dredged material placed in the CDF would not be a hazardous waste. The disposal of Arkema sediment in a Terminal 4 CDF should, therefore, be considered. The failure to consider CDF disposal for Arkema dredged sediment artificially inflates the disposal costs for alternatives related to the dredging at the Arkema site. In conclusion, EPA disregards the scope and intent of the HWIR Rule by placing arbitrary restrictions on what EPA believes can be placed into the T4 CDF if constructed. All of the EPA's Acceptance Criteria for the T4 are arbitrary and should be removed. Disposal of dredged material should follow the HWIR Rule as adopted by the State. This arbitrary action by EPA have severe negative implications for the FS and any subsequent RA.

EPA Position:

EPA sited CDF acceptance criteria in the 2016 FS, Section 3.4.9.2. There are no statements in the 2016 FS that identify a CWA requirement that the sediment must meet CDF acceptance criteria. EPA developed the CDF acceptance criteria based on protectiveness.

LSS Dispute Issue 5 - Feasibility study sediment and fish tissue dataset is not representative of current site conditions

EPA's draft final FS is based on a data collected between 1997 and 2007 and is not representative of current conditions at the site. The 2014 surface sediment PCB data collected by Kleinfelder to provide a current reference for comparison of the Portland Harbor RI dataset was not discussed or evaluated in the FS. It is unclear if the recent sediment PCB data collected by the RM11E Group was included in EPA's FS. These data are critical to the FS because the RM11E area is a source of PCBs in the upstream

portion of the site and has significant implications for assessing remedial alternatives, calculating SWACs, and assessing residual risk for the Portland Harbor site. PCBs are the primary risk driver for the Portland Harbor site and some of the most critical data for evaluating PCBs was omitted by EPA in the FS report.

A surface sediment and fish tissue dataset representing current conditions must be generated for the FS to accurately assess remedial alternatives. A new dataset will account for natural recovery that has occurred at the site since the Portland Harbor dataset was collected between 9 and 19 years ago and will fill a critical data gap in EPA's FS.

In Section 3.6.1.3, EPA's updated evaluation of fish tissue concentrations over time ignores 2002 data without any explanation. EPA states in this section a downward "trend" in fish tissue concentrations. In all but two instances (RMs 4E and 7E), concentration declines were not statistically distinguishable from zero. Possible explanations are the trend itself is close to zero, or the estimated coefficient could be very different from zero with a very wide confidence interval. The former would imply that the decay rate is small and that it is simply close to zero with strong level of confidence, whereas the latter indicates that the data are too sparse to precisely estimate the decay rate.

This section also states that the previous fish data are sufficient for baseline conditions for PCBs. This statement is incorrect since these data will be nearly 10 years old when the remedy is implemented and will not be representative of baseline conditions.

The Arkema pre-remedial design investigation work plan (Integral 2016) evaluated natural recovery at the Portland Harbor site (Exhibit 3, Appendix H). In this analysis, the original RI data sets were evaluated against more recently collected smallmouth bass fish tissue (2012), SPI (2013), and surface sediment PCB (2014) data. Based on a total of eight lines of evidence, including tests of statistical significance and a likelihood analysis, the weight of evidence strongly supports that natural recovery is occurring and will continue to occur within Portland Harbor. Therefore, MNR is a strongly viable process that should be utilized in Portland Harbor sediment remedies, including the area adjacent to the Arkema site. This analysis and its conclusions are directly relevant to EPA's alternatives analysis, comparison, and effectiveness evaluation, and therefore the lack of more recent data analysis biases the conclusions of EPA's alternative analysis and selection for sediment management areas (SMAs), including SMA 7W. EPA should incorporate the complete existing fish tissue data sets, as was done in the Integral (2016) analysis, and also allow for an updated fish tissue collection study to determine the current baseline fish tissue concentrations of COCs and demine the current site risk.

EPA Position:

As described in Section 1.3 of the 2016 FS, the FS data set included data collected under EPA oversight through authority of the Portland Harbor, Gasco and Arkema AOCs. The data presented in the 2014 Kleinfelder report were not collected under an EPA-approved,

work plan. As noted in EPA's position to LWG's dispute issue 1d, Respondents' 2012 draft FS notes that temporal changes in contaminant concentrations were not an objective of the data collection efforts, and that the aggregated data collected between 1997 and 2010 has been deemed representative of current conditions in the site. As clearly stated in Section 1.3 of the 2016 FS, sediment data collected by the RM11E Group were not included in the 2016 FS because upon review, the data was not significantly different than RI data. Thus, it should not be "unclear" whether these data were included. The PCB SWAC concentration for SDU RM11E represents one of the highest concentrations within the Site, and LSS provided no information why RM 11E data would alter the FS analysis of alternatives.

The 2016 FS uses sediment data collected as recently as recently 2013, and presents and discusses contaminant concentration trends in fish using data collected as recently as 2012. Thus, the assertion the data are a minimum of 9 years old appears deliberately misleading. As noted in Respondents' FS, the large data set is considered adequate to represent current conditions and is adequate for evaluating alternatives in the 2016 FS. Additional sampling to more fully assess "current conditions" is a remedial design issue and beyond the scope of the 2016 FS and dispute.

Tissue data for smallmouth bass collected in 2002 are not directly comparable with the data collected in 2007 and again in 2011/12. Individual fish collected in 2002 were composited by river mile without regard to side of the river prior to analysis. In 2007, fish were composited by river mile but segregated by side of the river prior to analysis, while fish collected in 2011/12 were analyzed individually. As discussed in the ODFW 2005 study cited in the risk assessments, radio tracking of smallmouth bass indicated that their home range is typically between 0.1 and 1.2 km, and they exhibited a strong preference to remain in near-shore habitat. Given the heterogeneous nature of the contaminant distribution within the site, contaminant trends in fish were evaluated by river mile and by side of river. Because of the compositing scheme used in 2002, meaningful comparisons of these data with subsequent tissue results are not possible.

The term "baseline conditions" here defines the conditions prior to initiating a response action. As such, since the existing data represent conditions prior to initiating a remedial response, they represent "baseline" conditions. EPA does agree that additional tissue sampling prior to implementing a remedy is appropriate, as the current data set is limited to a single species (smallmouth bass) and a single contaminant (PCBs). The exact nature and design of such a sampling effort is beyond the scope of the 2016 FS and dispute. With regard to the age of the data at remedy implementation, given that the most recent tissue data was collected in 2012, EPA is disappointed to learn that LSS has no intention of performing any work prior to at least 2022.

The Arkema pre-remedial design investigation work plan was disapproved by EPA on March 30, 2016 for the reasons provided in the disapproval letter. EPA concurs that natural recovery is occurring within most areas of the Site and that it should be utilized in the sediment remedies, as evidenced by the fact that MNR represents the response action

assigned to between 64 and 90 percent of the total area of the Site for all alternatives carried through the detailed analysis in the June 2016 FS.

LSS Dispute Issue 6 - Inappropriate use of PCB non-detected values in RAL and PTW footprint maps

The RAL and PTW footprint maps incorporate data with high PCB detection limits adjacent to the Arkema site (Exhibit 7). The high PCB non-detects with detection limits 5 times EPA's PTW value (e.g., >1 mg/kg) occurred in the Aroclor analysis as a result of a matrix interference with DDx. The RAL and PTW footprint maps should only consider detected PCBs based on PCB congener concentrations adjacent to the Arkema site due to the well-known matrix interference with DDx in PCB Aroclor analyses. The identification of PTW and remediation footprints for PCBs adjacent to the Arkema site based on non-detect values with elevated detection limits resulting from matrix interference with DDx is inconsistent with EPA's PTW fact sheet guidance and biases the assessment of PTW and remediation footprints for the SDU RM7W alternatives. This exaggerated PCB footprint will also bias the alternative selection for SDU RM7W. EPA should remove the PCB non-detect value from this PCB footprint analysis as it biases and exaggerates the area of PCBs in sediment at the site. If necessary, additional PCB congener data could be collected from these high non-detect sample locations to confirm the absence of high concentrations of PCBs at these locations.

EPA Position:

EPA used the data provided by the LWG. The LWG did not indicate that there were any issues with this data nor did they remove this data from the database provided to EPA. If there were issues with this data, LWG should have flagged the data and resampled the Site using congener analysis. EPA agrees that congener, not Aroclor, data should be collected at this Site in remedial design. Review of the footprints for PCB RAL contours (Figure 3.4-7), DDx RAL contours (Figure 3.4-12), and dioxin/furan RAL contours (Figures 3.4-8, 3.4-9, and 3.4-10) indicates that the SMA footprint offshore of the Arkema property is largely driven by DDx and dioxins/furans and overlaps with the PCB RAL footprint; thus, omitting PCB data from this area would not substantially change the evaluation in the 2016 FS. New data will be collected in remedial design that will determine the SMA boundaries based on the final RALs selected in the ROD.

LSS Dispute Issue 7 - Inaccurate RAL and PTW footprint maps

The PCB and PCDD/F RAL and PTW maps were contoured using natural neighbors gridding and did not account for the flow direction or depositional environments in a river system. The RAL and PTW maps in EPA's FS report blindly used nearest neighbor interpolation, and data points were inappropriately interpolated through upland areas. An example of this inappropriate interpolation is between points in the Willbridge Terminal and the area between Dock 1 and the Salt Dock on the Arkema Site (Figures 3.4-7, Exhibit 7 and 3.4-11, Exhibit 8). In this example, the points are not correlated and should not be interpolated through the upland portion of the Arkema site. The RAL and PTW maps must include some interpretation to reflect the physical features of the site and site uplands, as well as the hydrodynamics of a river system. This manual

interpretation should be done for the PCB and PCDD/F maps covering the area adjacent to the Arkema site.

EPA Position:
EPA acknowledges the limitations of natural neighbor interpolations. However, the primary limitation to natural neighbor interpolations is data density. Because the Willamette River is subject to frequent flow reversals, considering flow direction is not expected to improve the accuracy of natural neighbor interpolations. With respect to consideration of depositional environments, EPA's natural neighbor interpolation divided the Willamette River into three lateral zones – west nearshore, navigation channel and east nearshore which is considered the key geomorphic factor affecting flow dynamics within the lower Willamette River. EPA also acknowledges that some of the interpolations extended through upland areas. However, these instances are few and not expected to fundamentally alter depiction of the distribution of contamination at the site.

LSS Dispute Issue 8 - Inconsistent risk assessment methods and risk inequality for various compounds
Interim targets for risks and hazard indices (HIs), which were established by EPA in the FS "…to evaluate the potential for achievement of PRGs in a reasonable time frame" (Section 4.1.3) were not consistent between chemicals of concern (COCs) and RAOs. As such, estimated residual risks were not consistent among the COCs (e.g., total PCBs has 5x10-5 residual risk and DDx has 1x10-6 residual risk for RAO2 [Appendix J, Table J1-2]). This is mainly due to a very low and unattainable sediment PRG that was calculated using average fish tissue concentrations and ambient water quality criteria (AWQC) for surface water inputs to the food web model (FWM), which resulted in very low or even "0" value PRGs (issues related to the FWM are provided below in dispute issue 13). This then resulted in defaulting to background for several COCs. Remediation to background levels is not realistically achievable.

This FS also adopts entirely new methods to estimate pre- and post-construction risks for the alternatives (Appendix J). The residual risk evaluation process is neither technically sound nor transparent. There is no rationale or a clear example provided for the process. The FS states that methods used to evaluate residual risks are consistent with the Baseline Risk Assessments, but this is not an accurate characterization of these methods. Some examples of differences in risk assessment methods and assumptions include:
• Fish meals/10 years was not used in the BHHRA and no rationale was provided in the FS for using this unit.
• Appendix J presents the RM/SDU residual risks using fish ingestion rate of 49 g/day, however, PRGs based that ingestion rate have not been selected in the FS.

The difference in the risk assessment methods risks is apparent if the risks estimated for Alternative A (no action) are compared to baseline risks from the BHHRA—these should be the same.

The only spatial scale that allows for direct comparison of risks is at the sitewide scale. The sitewide fish consumption risks estimated in the BHHRA (summarized in Section 1.2.5.1) are higher than those presented for Alternative A in Table J2.3-1a. However, the risks for Alternative A are based on average concentrations whereas the BHHRA risks are based on 95% upper confidence limit (UCL) or maximum concentrations. The average PCB concentration in the BHHRA based on actual tissue data was 160 µg/kg in bass and 2,500 µg/kg in carp, which includes a single outlier sample of 19,000 µg/kg (the average without the outlier is 353 µg/kg). The modeled tissue concentrations used for Alternative A are 352 µg/kg for bass and 820 µg/kg for carp, which are approximately 2 times higher than the measured tissue concentrations (excluding the single carp outlier).

The river mile risks for Alternative A cannot be compared directly with the BHHRA because the risks for Alternative A are on a rolling river mile basis for both sides of the river and navigation channel whereas the BHHRA risks were for an entire river mile. The risks for Alternative A are generally higher than those in the BHHRA (potentially due to spatial scale issues). In the BHHRA, risks at RM 11 were 1x10-3 and all other risks were less than 1x10-3. For Alternative A, there are several segments with risks of 1x10-3 or higher.

There continues to be an issue with EPA's modeled dioxin/furan tissue concentrations. In the BHHRA, the sitewide risk from the total toxicity equivalent (TEQ) based on the 95% UCL or maximum concentration for actual tissue data was 2x10-4. For Alternative A, the sitewide risk from 1,2,3,4,7,8-HxCDF alone based on an average concentration is 6x10-4 (Table J2.3-1a of EPA's FS report). There is no way that the risk from an individual congener can be higher than the total TEQ.

Furthermore, the residual risk assessment appears to present relative risks and not absolute risks. The term "residual risk" is used in different ways throughout the document, but it appears that EPA first estimated risks associated with the selected PRG (in general a risk of 1x10-6 or an HQ of 1 where the PRG is risk-based, but some other value if the PRG is not risk-based). For example, for RAO2, the residual risk (which is a ratio of the selected tissue PRG to the risk-based tissue PRG) for DDx is 10-6 because the fish tissue PRG (3 parts per billion [ppb]) is equal to the risk-based tissue PRG (3 ppb). However, for PCBs, the risk-based fish tissue PRG is 0.5 ppb and yields a "0" sediment concentration, and the PCB sediment PRG, which is the background value of 9 ppb, is apparently used in the FWM to calculate a PCB fish tissue concentration of 23 ppb (Table J1-2 of the FS). The sitewide residual risk for PCBs was estimated to be 5x10-5 (i.e., 23 divided by 0.5 and multiplied by 10-6). Then the "post-construction risks" was calculated for each alternative using SWACs to estimate fish tissue concentrations, again using the FWM and ratio of this "post-construction risk" and the "residual risk" to understand the "magnitude of residual risk." Again, this is relative risk and not absolute risk. Therefore, the risks between COCs are not comparable as some are based on actual risks (where the selected PRG is risk-based) and some are relative risks (where the

selected PRG is not risk-based). This approach is not at all consistent with the methods of the BHHRA and BERA and also misleading.

The post-construction sediment concentrations also appear unrealistic. For example, some of the PCB and DDx post-construction concentrations in Table J2.3 are below the background concentrations. Other tables in Appendix J show similar results. It is unclear how remedies will result in concentrations below background. In addition, the concentrations of COCs used in the remediated areas to calculate the post-remediation SWACs were 0, which does not account for dredge residuals or background (upstream) concentrations of COCs.

A significant deficiency of the residual risk evaluation is that it does not provide residual risks for any time frame other than the immediate post-construction condition (Time 0). As reported in the FS (Section 4.1.3):
As a long-term model is not available to predict the time to meet the PRGs, interim targets for risks and HIs were established to evaluate the potential for achievement of PRGs in a reasonable time frame, which was considered to be 30 years, commensurate with the site-specific contaminants and conditions. These interim targets are higher than residual risks once PRGs are achieved, and assume that further reductions with be achieved through MNR.

The calculated post-construction risks and HI values are higher than the interim target risks and HI. Because much of the remedy relies on MNR, the lack of a residual risk estimation process for time intervals post-construction (up to year 30) makes the usefulness of the residual risk estimates limited and almost worthless in terms of comparing the protectiveness of the remedies.

Furthermore, there is very little difference in net risk reduction between Alternatives B and I for almost all COCs. For most of the COCs, the differences are less than a factor of 2 and sometimes much smaller (e.g., difference in HQ of 0.25). Given the very conservative assumptions that were used to calculate PRGs, differences in estimated risks by a factor of 2 or less are not significant. A more reasonable criteria for evaluating differences in estimated risk between alternatives would be a factor of 10, which should be considered the minimum significant difference given the limited sensitivity of these criteria. A probabilistic-type risk evaluation, which incorporates the quantitative uncertainties, would be a more appropriate approach.

This small difference in risk reduction between alternative remedy scenarios is likely due to the driving PRGs being based on background. The risk associated with background levels of COCs should be presented in a side-by-side comparison to the residual risk estimates in order to demonstrate the benefit of the remedial measures to the public. Based on the residual risks presented, any remediation beyond Alternative B (which does show a great degree of risk reduction from Alternative A, no action, than the difference

between other alternatives) is unwarranted. The very large increase in costs for minimal and insignificant risk reduction between Alternatives B and I is not recognized in the FS.

In summary, the removal volumes in Alternative I cannot be justified as a cost-effective reduction of risk in comparison to other alternatives. Nor can the use of mixed criteria such as PRGs (and RALs) from different alternatives (i.e., "E" and "F" applied either site-wide or within an SMA) be justified based on differences in risk outcomes that are with an order-of-magnitude. To adequately assess the alternatives, an accurate assessment of risk needs to be completed using the risks identified in the EPA-approved BHHRA and BERA. The improper modifications to the risk assessments and assessments of residual risk should be removed from the FS document.

EPA Position:
Residual risk is clearly defined in the 2016 FS as the cumulative risk associated with the PRGs, whether risk-based or otherwise. The use of a PRG associated with a background concentration, when that value is greater than a risk-based concentration, is consistent with EPA policy. LSS' claim that "remediation to background levels is not realistically achievable" is simply declarative and wholly unsupported by any information provided by respondents. In fact, the 2014 Kleinfelder report repeatedly cited by LSS in this dispute presents a simple mean upstream PCB concentration of 5.8 µg/kg. This value is essentially the same as the UCL on the mean of 5.6 µg/kg PCBs from the background data set and presented in Table 7.3-1 of the final RI. Thus, if the more recent data submitted by respondents are taken solely at face value, the background levels presented in the 2016 FS are not only realistically achievable, but may be high relative to more recent data.

The number of acceptable fish meals per unit of time represents nothing more than a calculation of post-construction or residual risk, based on predicted tissue concentrations using the models developed and used by the LWG. Consistent with the assumptions used in the BHHRA, post-construction fish consumption risks on a river-mile scale were evaluated using PRGs calculated based on a consumption rate of 49 g/day.

Respondents' assertion that "risks for Alternative A are based on "average concentrations" versus the "95% upper confidence limit" is directly contradicted by the information presented in the 2016 FS, which states in Section J2.1 "A site-wide average concentration for each COC – represented by the 95 percent upper confidence limit on the mean – was then calculated for each RAO 2 COC using ProUCL." We note that according to EPA guidance, the 95 percent upper confidence limit (UCL) of the arithmetic mean should be used when calculating the "average" concentration to represent the exposure concentration. Further, EPA is unclear of the basis for respondents assertion that the average PCB concentration in the BHHRA was 160 µg/kg in bass and 2,500 µg/kg in carp, as Table 3-12 in LWG's final BHHRA presents mean PCB (measured as Aroclors) tissue concentrations for whole body smallmouth bass and carp of 1,200 µg/kg and 1,700 µg/kg, respectively. The corresponding mean tissue

concentrations for PCBs measured as congeners are 1,100 µg/kg and 2,800 µg/kg in smallmouth bass and carp, respectively.

Risk estimates associated with consumption of fish presented in the 2016 FS were calculated using sediment data to estimate tissue concentrations, while risk estimates in the BHHRA used measured tissue concentrations. For the purpose of evaluating the effectiveness of different alternatives, sediment concentrations were averaged separately for each section by side of river to account for the fact that the majority of contamination, as well as habitat for fish is located in the nearshore areas. Respondents provide no basis in statute, EPA policy or guidance that an analysis of risks in the 2016 FS must aggregate data exactly as was done in the baseline risk assessments.

See EPA's position to LWG's dispute issue 1k regarding measured versus predicted dioxin/furan risks.

No definition of "actual risks" or "absolute risks" is provided. However, it appears LSS believes that risks associated with background concentrations qualify as "relative." Risk is directly related to concentration, and does not recognize the basis for that concentration. Thus, risk estimates for two or more different COCs are "comparable" and additive.

As noted, post-construction COC concentrations in areas assigned dredging or capping were assumed to be zero, as the 2016 FS assumed clean material would be used for caps, and that the residual layer applied to dredged areas would consist of clean sand. The absence of a defensible fate and transport model precluded estimating COC concentrations with any degree of certainty in these areas for any time-frame beyond the immediate post-construction period. Regardless, the same metric is used for each alternative, and the resulting comparative analysis is adequate for FS purposes.

The use of interim targets is consistent with EPA's sediment guidance. The degree to which estimated post-construction risks approach the risk associated with the proposed cleanup goals provides a measure of the degree to which MNR must be relied upon to achieve the cleanup. If, as LSS postures, the lack of an estimation process for time intervals post-construction renders the residual risk estimates almost worthless, the most logical conclusion would be for the ROD to acknowledge that limitation and select Alternative H, as it is the only alternative for which final COC concentrations can be estimated with any certainty.

No justification is provided by LSS for the assumption that a factor of 10 in risk estimates is needed to distinguish between alternatives. The effective use of probabilistic methods is reliant on the distribution of the estimates for the terms to be varied. The LWG's attempt at a probabilistic analysis (2012 Draft FS Appendix E) relied on assuming distributions for the population representing various inputs because the underlying data regarding the shape of the distribution was unknown. Further, EPA noted in its 2013 disapproval of the LWG 2012 draft FS that EPA guidance on probabilistic risk

assessment clearly notes that probabilistic methods should not be used to develop PRGs when point estimates were used in the risk assessment.

"Background risks" are explicitly included in the residual risk estimates presented in Appendix J1 for those COCs for which the PRG is based on background concentrations. Post construction risk estimates, and well as estimated costs, for Alternatives B and I are presented in the 2016 FS.

The 2016 FS does not conclude that the removal volumes in Alternative I are justified as "a cost-effective reduction of risk in comparison of other alternatives," rather, the comparative analysis evaluates the relative performance of each alternative in relation to each specific evaluation criterion. The determination of the merits of Alternative I relative to other alternatives was made in the Proposed Plan, and Respondents dispute rights do not extend to that document. Respondents provide no support from CERCLA, EPA policy, or guidance to support their assertion that an order of magnitude difference in risk outcomes is needed to distinguish between alternatives. PRGs are not applied as a "mixed criteria" in the 2016 FS, the same PRG for each COC is used in all alternatives.

LSS Dispute Issue 9 - RALs are not tied to PRGs and site risk

It is not clear how the RALs equate to risks, other than value for Alternative H, and only if based on the 10-6 risk-based PRG but not based on background. The risks from the RALs and background levels of COCs should be presented side-by-side to demonstrate the risk reduction for these alternatives.

Risk-based PRGs should be consistent with the spatial scales of the exposure scenarios used to characterize risk in the approved baseline human health and ecological risk assessments for evaluating cleanup alternatives. The spatial scales over which the PRGs are applied are a key element of the respective exposure scenarios being represented by the PRG. The spatial scales are as fundamental to establishing PRGs as the numeric values themselves. Various spatial scales were used in developing PRGs in the FS (Section 4.1.1): (1) Benthic risk was evaluated on a population level as the area exceeding RAO5 PRGs (2) 0.5 RM was used for RAO1 (sediment only) for direct contact exposure of people engaged in fishing activities, (3) 1 RM was used for RAOs 2 and 6 for the dietary exposure of humans and ecological receptors that consume fish and shellfish, and (4) Sitewide for RAO2. In the FS, COC concentrations were estimated on a rolling average developed from the surface sediment data in the FS database. Surface sediment results were averaged over a distance of 0.5 mile (RAO1) or 1 mile (RAOs 2 and 6) in successive 0.1-mile increments in both the east and west nearshore segments, and the navigation channel. Although the spatial scales match the baseline risk assessment exposure areas, the sediment concentrations calculated for the alternatives are not the same as in the baseline risk assessments and therefore, residual risks for the various

alternatives cannot be compared to baseline conditions, except for sitewide conditions (see dispute issue 8 above).

For RAO2, two scales were used to derive two sets of PRGs, sitewide and 1RM, using consumption rates of 142 g/day (based on the subsistence fisher) and 49 g/day (based on the recreational fisher), respectively. However, the selected PRGs for RAO2 are shown to be the ones derived based on the sitewide scale (shaded green in Table B3-5). The 1RM scale PRGs assume that recreational fishers will only be exposed to that portion of the river, which is a very conservative and unrealistic assumption. The RALs for RAO6 only used the 1 RM scale. This corresponds with the home range of species such as smallmouth bass, hooded merganser, osprey, bald eagle, and mink that were evaluated in the BERA. Ecological risk is managed on a population scale and even if a home range is within a river mile, the contiguous population may be exposed over a larger area.

In summary, the spatial scales, exposure scenarios, and estimation of exposure concentrations for the remedy development and residual risk evaluations vary from those used in the BHHRA and no clear rationale is provided for the approach.

EPA Position:

It seems that the Respondent is confused between PRGs and RALs. PRGs are established in various media using risk-based values, ARARs, and consideration of background. PRGs are developed independent of spatial scales in Section 2 of the 2016 FS. However, PRGs are evaluated at relevant spatial scales based on exposure assumptions developed in the baseline risk assessments in Section 4 of the 2016 FS. Respondent agreed that the spatial scales used in the 2016 FS matched the baseline risk assessment exposure areas. The disparity in the risk estimates calculated in the baseline risk assessments for exposure to sediment and those in the residual risk estimate is due to the aggregation of the data. The baseline risk assessments aggregated data by dividing the site into discrete areas based on exposure (for RAO 1 direct contact to sediment, the river was divided into nearshore areas and then further divided into 0.5 river mile segments – RM 0-0.5, RM 0.5-1, RM 1-1.5, etc.) whereas the 2016 FS evaluated the same 0.5 river mile exposure assuming that the exposure could be to any 0.5 river mile (for RAO 1, the river was divided into nearshore areas and then divided into 0.5 river segments by 0.1 river mile increments – RM 0-0.5, RM 0.1-0.6, RM 0.2-0.7, etc.). Further, most of the risks in the baseline risk assessments were based on measured tissue data whereas the 2016 FS used models to predict tissue concentrations based on sediment concentrations. Again, the fish tissue data were aggregated by segmenting the river while the 2016 FS did not assume that fish reside only in a particular river segment, but could reside in any part of the river within that spatial scale. The BHHRA evaluated fish consumption on a Site-wide scale using 142 g/day consumption rate and a one river mile scale using 49 g/day. The 2016 FS used this same assumption and spatial scale; thus, is consistent with the BHHRA. Since EPA used this approach consistently to the no action alternative and to each of the

remedial alternatives evaluated, the comparison of alternatives in the 2016 FS can be compared to the baseline conditions at any spatial scale considered.

In Table 2.2-3, several COCs have "A" under the columns for RAOs 3, 4, or 8. It is unclear why this is necessary. There are no data to justify selection of ARAR-based COCs as provided in Table 2.2-3a. The FS text simply states "contaminants that were detected in upland media (storm water and groundwater) that may potentially migrate to the river at concentrations that would exceed the Safe Drinking Water Act MCLs and national or State of Oregon water quality criteria were also designated as ARAR-based COCs." Data or references are required to substantiate this assertion. In addition, the rationale behind assignment of ARAR-based PRGs is not clear and transparent.

EPA Position:
All of the "A" designations under RAO 3 are incorrect and should be "R." See EPA position to LWG's dispute issue 1d regarding application of MCLs and ARARs.

For some COCs (PCBs and dioxin/furan congeners), the sediment PRGs (RAO2) that were developed using the FWM based on target tissue concentrations were assigned a value of zero. Therefore, the PRGs selected for these COCs are background. The mathematical rationale provided is that when using the FWM, dissolved concentrations alone are predicted to result in estimated tissue concentrations greater than the risk-based target. This indicates some flaw in the FWM. Appendix B also states that the FWM presented in detail in the Bioaccumulation Modeling Report (Windward 2015) was submitted to, but not approved, by EPA. However the sediment PRGs for RAO2 and RAO6 are based on this FWM. Note, for RAO6, sediment risk-based sediment PRGs could be estimated for PCBs and dioxins/furans (much higher than background). For the FWM, the OR AWQC were used as post-remedial water concentrations. Note that LWG has disagreed with the use of AWQC in the FWM; instead upstream water concentrations should be used.

EPA Position:
EPA disagrees that surface water concentrations alone can result in tissue concentrations that could pose unacceptable risk. Such a statement indicates a fundamental lack of understanding of the Arnot and Gobas model used by the LWG. The Arnot and Gobas model is a complex, fugacity-based model that estimates tissue concentrations resulting from exposure through a variety of measures, including gill uptake and dietary exposure, as well as accounting of transformation and elimination through metabolic processes. The mechanistic nature of the model is such that certain model outputs in fact represent inputs to other portions of the model. For example, the dietary preference for certain fish may consist of a sufficient proportion of zooplankton and phytoplankton such that exposure via diet alone, of in combination with gill uptake may result in a tissue concentration exceeding risk-based concentrations, particularly in species that prey on planktonivorous fish. In fact, the LWG's submittal of Early Preliminary Remediation Goals (March 2009) presented sediment PRGs for several contaminants as "<0," indicating that a sediment concentration of 0 in conjunction with the input water concentration resulted in an

estimated tissue concentration exceeding the risk-based target. The LWG did not identify this as "some flaw in the model" when it submitted the report to EPA for approval.

While the Bioaccumulation Modeling Report as submitted by LWG was never approved, EPA did notify the LWG on November 18, 2014, that the Arnot and Gobas food web model as calibrated by the LWG was approved. **[AR Doc # 100005458]** Since AWQC represent ARARs in surface water that must be achieved, EPA believes they appropriately represent surface water concentrations to calculate PRGs in sediment using the food web model.

It is also not clear if risk from background was accounted in the risk reduction. In addition, some of the post-construction calculated sediment concentrations are below background.

EPA Position:
Risk from background was accounted for in the residual risk if background exceeded the risk-based PRG. Post construction calculated sediment SWACs were calculated using a replacement value of zero (the assumption was that clean material would be used in caps and residual covers). If enough of the values in a SWAC area are replaced with zero, it could result in a concentration below background. This would mean that the alternative is more aggressive than necessary to achieve the PRGs. EPA acknowledges that after the remedy is constructed, surrounding sediment and upriver sediment will mix with the clean material which will result in some equilibrium concentration greater than the post construction SWAC, but could not be calculated due to too many unknown variables (area-specific deposition rates, depth of mixing, sediment transport rates in the Site, etc.) and is too difficult to compute without a functioning fate and transport model.

The RALs developed for dioxins and furans in the FS (Section 3.4.1.2) are based on several assumptions leading to low confidence and high degree of uncertainty. PRGs for dioxins/furans are less than or within the MDLs. The FS recognizes that due to low data density, interpolations are required across large areas with no data, leading to large footprints that exceed these uncertain RALs.

The RALs need to be related to the PRGs for the site that were developed from the EPA-approved BHHRA and BERA. The spatial scales, exposure scenarios, and estimation of exposure concentrations for the remedial levels, should be on the same basis as for the BHHRA and BERA. Remedial levels should be no lower than background for COCs that have PRGs that based on background. Uncertainty in remedial areas identified needs to be accounted for in the cleanup area assessment especially for COCs that have small data sets and low data density, such as dioxins and furans.

EPA Position:
PRGs developed for dioxins/furans are all quantifiable. All RALs developed for focused COCs, including dioxins/furans, are all greater than the PRGs. EPA agrees that there is a higher degree of uncertainty in the dioxin/furan areas delineated in the 2016 FS, but that

the estimated costs are within the accepted cost range of +50/-30 percent. It is expected that that uncertainty will be resolved in remedial design.

LSS Dispute Issue 10 - PRGs and RALs are inconsistent with other sediment sites

EPA's Portland Harbor PTW value for total PCBs (200 µg/kg) is much lower than the hot spot remediation and expanded hot spot remediation values for the Hudson River site (30,000 and 10,000 µg/kg, respectively). Cleanup goals for other sites are significantly higher than the PTW concentration for Portland Harbor and were not defined as PTW for these other sites. For example, the PCB cleanup goal protective of human health is 386 µg/kg for Yosemite Slough in San Francisco, California; 1,240 µg/kg for Hunters Point, California; and 1,000 µg/kg for Fox River, Wisconsin. The cleanup goal for Passaic River in New Jersey is based on the background of 460 µg/kg. All of these cleanup goals protective of human health are greater than the 200 µg/kg PTW value for PCBs proposed for Portland Harbor.

PRGs developed in the FS using parameters and assumptions used in the baseline risk assessment are considered very conservative. For the BHHRA, upper end of the exposure parameters were used for estimating risks. For example, assuming a subsistence fisher would consume fish 149 g/day from the site alone is highly unlikely. Not refining these conservative assumptions for developing PRGs is considered unrealistic. The FS should utilize assumptions and targets that are reasonably achievable given the background conditions and other factors affecting implementability.

EPA's use of sediment PRGs for riverbanks, even on areas rarely inundated and without considering attenuation, is technical inappropriate. Delineations of groundwater plumes and riverbanks, and a zero post-construction restoration time frame are arbitrary. There is a total lack of data and analysis as to what risk considerations are driving the specific remedial actions delineated (and therefore how this will be refined in the design phase when further data/analysis is available) and what specific remedial actions will be implemented in which areas driven by those risks. This arbitrary delineation is then carried forward into the evaluation of alternatives and given weight for assessing the relative effectiveness of alternatives.

EPA's Portland Harbor PTW value for total PCBs (200 µg/kg) is much lower than hotspot remediation and cleanup goals for other PCB-imapcted sites. EPA should modify the PTW values in the FS to make them consistent with other sediment sites such as the Hudson River site noted above.

EPA Position:

As a general matter, the NCP provides a framework for assessing and managing risks at Superfund sites. More information and many recommendations for assessing both human health and ecological risks and developing cleanup levels are provided in several guidances and fact sheets issued by the Superfund program. These guidances by design are not prescriptive and provide the regions with discretion to make decisions based on site-specific data and information. A principal tenant of the Superfund program is that all

baseline risk assessments and cleanup levels should be based on site-specific exposure data and the reasonable maximum exposure that could occur at a site. Cleanup levels typically are based on site-specific risk, ARARs or background.

Based on site-specific information, EPA applies the reasonable exposure pathways, exposure factors, and risk level within the 10^{-4} to 10^{-6} risk range(with 10^{-6} being the point of departure) for choosing cleanup levels appropriate for the site. Different site-specific circumstances can account for the variability in cleanup goals between sites. Sediment cleanup goals and fish tissue targets may not be set at risk-based concentrations, where site-specific conditions, background concentrations, and available remedial technologies indicate that risk-based goals are not expected to be achievable. Under these circumstances higher cleanup levels may be set, in addition to fish consumption advisories to reduce exposure and to achieve protection.

The Portland Harbor risk-based goals for individual contaminants are based on 10^{-6} cancer risk or a non-cancer hazard of one and achieve a cumulative cancer risk level at 10^{-5} to comply with Oregon's residual risk ARAR for this Site. That level of protection for most exposures is achievable at Portland Harbor based on current information. Where sediment background concentrations are higher than that risk level, background concentrations are used.

Risk-based PRGs in the 2016 FS are developed consistent with the exposure assumptions in the baseline risk assessments. Consistent with the BHHRA, both the subsistence fisher consumption rate of 142 g/day and the recreational fisher consumption rate of 49 g/day were used to develop risk-based PRGs in the 2016 FS (see Appendix B). The Respondent does not provide any detail as to which 2016 FS assumptions and targets are not readily achievable given background conditions nor provides which factors affecting implementability are not reasonable. EPA believes that the 2016 FS assumptions and targets are reasonably achievable, considered background conditions, and factors affecting implementability.

LSS complained that our PTW values and our PRGs for PCBs were lower than cleanup levels at other sites. As stated above, every cleanup decision is based on site-specific circumstances. Likewise, the cleanup decision itself can be structured in many different ways making simple comparisons of "cleanup" numbers misleading at best and just plain wrong at worst. A cursory review of the site decision documents for the sites and "numbers" referenced by LSS illustrates this point. The Hudson River numbers LSS references were hot spot remediation levels that required removal, not the final cleanup goals. The Yosemite Slough is a removal action and may only be addressing ecological risks. The Hunters Point site from what we could tell has not made a final cleanup decision at this time. Furthermore, 1ppm is only the remedial action level at the Fox

River site, not the final cleanup goals which are not significantly higher than PRGs proposed for Portland Harbor.

LSS Dispute Issue 11 - Methodology for calculating background concentrations

EPA's proposed background values based on inappropriately derived upstream bedded sediment statistics are unlikely to represent achievable cleanup levels for the site. The FS also does not present background concentrations for surface water and does not present sediment background concentrations for all chemicals with sediment PRGs.

A sediment remedy must include evaluating what is deposited within the Study Area, both physically and chemically (i.e., potential future bedded sediment equilibrium). EPA has not conducted such an evaluation. The cleanup goal for PCBs of 9 ppb based on EPA's calculation of background concentrations is not achievable. Background should not be used to establish cleanup goals when likely ongoing contaminant inputs from upland sources within the Site and upriver of the Site exceed EPA's calculation of background. The LWG provided EPA an evaluation of equilibrium concentrations for the Site that are a much more reliable indicator of future concentrations that can be achieved.

More specific detail is provided below for PCDD/F compounds in sediments and other COCs and media.

EPA Position:

Background values were derived using data specific to the Portland Harbor site and overall watershed. Use of site-specific information is consistent with EPA background guidance, and because site-specific data are available, comparisons to other urban watersheds, which may or may not be similar to Portland Harbor, are not relevant.

See EPA's position to LWGs dispute issue 1g.

LSS Dispute Issue 11a - Background concentrations PCDD/F compounds in sediment

Sediment PRGs for RAO2 and RAO6 as well as riverbank PRGs for RAO9 for the five PCDD/Fs congeners are based on background concentrations. Background PCDD/F concentrations for individual congeners are presented in Appendix B, Table B2-4 of EPA's FS.

EPA uses new methods for deriving these levels that appear significantly different from both EPA's methods for other chemicals as well as past LWG input on this subject. Sediment PRGs for RAO2 and RAO6 as well as riverbank PRGs for RAO9 for the five PCDD/Fs congeners are based on background concentrations.

The background values are based on limited and poor quality data (with elevated detection limits). In fact, only one congener has sufficient data (1,2,3,4,7,8-HxCDF) to calculate a background value and even that is limited (13 of 31 samples were non-detects). Thus, most of the background "values" are based on a 95% UCL of the

detection limits. The background values also appear skewed quite low compared to other urban watersheds.

The background values estimated based on this limited data and approach, furthermore, are low and approximately an order of magnitude lower than values from other regions and watersheds. For example, a memorandum published by EPA in 2010 provides a good summary of background levels for dioxins/furans in sediment, which range from approximately 2–5 parts per trillion (ppt) as TEQs. It also summarizes values from Puget Sound which include a TEQ value of 4 ppt for non-urban areas but allowing up to 10 ppt as TEQs for open water disposal; this value is also used in San Francisco Bay and elsewhere. (https://klamathrestoration.gov/sites/klamathrestoration.gov/files/EPA%20Klamath%20dioxin%20memo%201-13-10%20final.pdf). The Duwamish Waterway FS establishes an upper bound background value for dioxins/furans as 11.6 ppt TEQ.

Background values in other regions and watersheds are expressed as TEQs, which is generally the manner in which cleanup goals for dioxins/furans are expressed. For Portland Harbor, EPA used 5 individual congeners. The individual congener background values provided in Appendix B of the FS and in the PRG tables for RAOs 2 and 6 can be converted to TEQs using TEFs, which results in a value of 0.56 ppt on a TEQ basis (since the 5 congeners equate to the majority of the risk, this value may be slightly biased low, but probably less than 10% of the total TEQ). This background value is an order of magnitude or more lower than the range of values, mainly for non-urban areas, from the literature. A study to better define background levels for dioxins/furans is necessary since the calculated risk-based PRGs are well below even these low-biased background levels resulting in the background values being adopted as the final PRGs. Otherwise, it is unlikely that the remedies for dioxins/furans will be successfully implemented and estimated risk reductions for dioxins/furans will be realized. This latter issue addresses the validity of the alternatives analysis and its biased outcome.

It should also be noted that no background values are listed for RAOs 1 or 3. Those PRGs are expressed as TEQs and data is lacking to identify a background level on a TEQ basis. This needs to be rectified; those PRGs may be below background. In fact, the PRG for RAO3 is 4 orders of magnitude below the MCL and is likely not measurable at that level. Overall, providing PRGs that are below MCLs is inconsistent with other cleanup actions under CERCLA or other programs. Cleanup to below MCLs is unlikely to be achievable.

EPA Position:

As noted in Section B2.4, background for 1,2,3,7,8-PeCDD, 2,3,4,7,8-PeCDF, 2,3,7,8-TCDD, 2,3,7,8-TCDF were established as the 95th percentile of the detection limits in the background data due to the very low frequency of detection of these analytes in the background data set. Thus, any detection of these congeners can be construed as representative of contamination. Respondents' calculation of a background value on a TEQ basis appears contradicted by their subsequent statement that "data is lacking to

identify a background on a TEQ basis." EPA continues to believe that background values in sediment expressed solely as a TEQ would be inconsistent with the risk assessments, which assess exposure via bioaccumulation through the food chain. Information submitted to EPA by the LWG in its validation of the food web model for dioxin/furans clearly demonstrates that the individual congeners bioaccumulate at different rates, and information presented in the 2016 FS Section B2.2 demonstrates that calculated TEQ values in sediment do not correlate with calculated TEQ values in biota. The PRG for dioxin/furans is based on Oregon water quality standards.

LSS Dispute Issue 11b - Background concentrations for other COCs and media

The FS (Section 2.2.2.4) states that only sediment background concentrations were estimated and background concentrations for other media could not be calculated due to insufficient data. However surface water background concentrations were calculated in the RI. Upriver surface water background concentrations COCs are orders of magnitude higher than the ARARs based on the AWQC. Note, the background UCLs for upriver surface water (dissolved concentrations with outliers removed; Table 7-4b of RI) vs RAO3 AWQC-based PRGs. For example, the background UCL concentrations for DDT, PCBs and TCDD Teq are all significantly less than the respective RAOs for these substances:

- *background UCL for DDT = 0.000114 µg/L and the ARAR (RAO3) is 0.00002 µg/L*
- *background UCL for PCBs = 0.000126 µg/L and the ARAR (RAO3) is 0.000006 µg/L*
- *background UCL for TCDD Teq = 0.000126 µg/L and the ARAR (RAO3) is 0.000000033 µg/L*

Because of the deficiencies in determining the background levels, a new background study for sediment, surface water and tissue needs to be conducted in the design phase. The results of this evaluation need to be used to update PRGs, RALs and SDUs.

EPA should not use background to establish cleanup goals when likely ongoing contaminant inputs from upland sources within the Site and upriver of the Site exceed EPA's calculation of background. A better approach was provided by the LWG using equilibrium values.

EPA Position:

See EPA's position to LWG's dispute issue 1g.

Respondents refer to Table 7-4b of the RI; however, the Final RI does not contain a Table 7-4b.

LSS Dispute Issue 12 - Benthic risk models do not honor the measured data

EPA made extensive changes to the benthic approach for this FS, but those changes are still inconsistent with the comprehensive benthic risk approach contained in the approved BERA). The FS states: "The protection of benthic species to contaminated sediment is evaluated using the benthic risk area defined by an order of magnitude greater than the RAO5 PRGs. The post-construction interim target for RAO5 was established at 50%

reduction in the area posing unacceptable benthic risk." So, instead of using the CBRA, EPA now maps benthic PRG exceedance factors on a point-by-point basis and uses a 10 times exceedance factor to identify areas of concern. EPA then concludes that if 50% of this area is actively remediated, the alternative is "protective" on an interim basis. It is completely unclear how this new method is: 1) in any way more accurate or consistent with the BERA; and 2) more predictive of benthic risk or the effectiveness of the alternatives, as compared to simply using the CBRAs, which are entirely consistent with the BERA.

Furthermore, and most importantly, the benthic risk models used by EPA do not honor the measured data. Although the LRM and FPM are model predictions using data from the toxicity texts conducted with site sediments, much of the measured data is not honored. Any modeled risk for benthic invertebrates that ignores actually toxicity testing results needs to be assessed in weight-of-evidence and river-mile specific decision-making. The benthic risk footprints should not extend into areas shown to have a lack of toxicity based on actual laboratory toxicity tests. This error has been carried through the alternatives analysis and therefore has biased the selection of alternatives for SMAs in the FS.

EPA should modify the benthic approach in the FS so it is consistent with the BERA and honors all measured data.

EPA Position:
See EPA Position to LWG dispute issue 1b.

The benthic risk models were not used by EPA in the 2016 FS. The benthic risk models were used by LWG contractors (Windward Environmental) to determine risks in the BERA. EPA used the outputs of those models provided as a GIS layer in developing the maps in the 2016 FS, Appendix D10. However, the comprehensive benthic risk map (2016 FS Figure 4.1-1) was developed using interpolation of surface sediment concentrations exceeding the RAO 5 PRGs. Since EPA is not requiring action based on these PRGs, they will be monitored post construction until such time as they are achieved.

LSS Dispute Issue 13 - Food Web Model (FWM) for DDx and PCDD/Fs
The FWM is used by EPA to back-calculate concentrations of chemicals of concern (COCs) in sediment associated with acceptable, risk-based human health and ecological concentrations in fish tissue as calculated using the baseline risk assessment (Kennedy/Jenks, 2013). This influences sediment PRGs and hence RAOs, so uncertainty originating with the FWM cascades, having compounding effects on the evaluation of remedy alternatives, and could result in additional remediation costs with no meaningful

gains in risk reduction. We identify the following shortcomings with EPA's application of the FWM at the Site:

A comprehensive and detailed Conceptual Site Model (CSM) for the Site in total, and for the relationship between COC sediment and fish tissue concentrations specifically, has not been presented by EPA. This means that EPA's chief assumptions for the FWM related to steady-state conditions (in a major river), the completeness of the site characterization dataset, regional contributions of COCs, and the apparent relationship between sediment and fish concentrations.

Based on an examination of the empirical data for the Site, no statistically significant relationship is observed between sediment and fish tissue concentrations for DDx and PCDD/Fs at the concentrations relevant to risk decision making. This means that the FWM - which assumes such a relationship exists – is not reliable and that the conclusions reached on its basis are fundamentally inaccurate.

Good modelling practice was not used by EPA for the FWM, and in particular sufficient model documentation detailing the work does not exist. Adequate model documentation is one of several criteria used by EPA and other international regulators for determining the acceptability of a model for regulatory decision making (USEPA 2009, EFSA, 2014, Grimm et al., 2014).

EPA should not use their FWM to evaluate sediment PRGs if there is no statistical relationship between sediment and fish tissue concentrations for key COCs such as DDx and PCDD/Fs.

EPA Position:
See EPA's position to LWG's dispute issue 1l.

LSS Dispute Issue 14 - Overly prescriptive and flawed approach used to assign remedial technologies
The FS acknowledges uncertainties in site characterization and the conservative assumptions used to form the basis for associated technology assignments, however EPA continues to use a prescriptive set of technology evaluation and scoring criteria to determine the technologies to be applied in each area of the site and, with the exception of a vague paragraph in Section 3.8.1, the FS is silent regarding the degree of flexibility that is envisioned to be available during remedial design to refine technology assignments based on the additional information gained through future pre-design investigations. This will lead to a lack of flexibility with regard to technology assignments, depth of removal, potential improvements in technology, design efficiencies to address remedial and CWA/ESA requirements, etc.

EPA should clearly explain the conditions under which changes to major alternative elements (e.g., changes in technologies assignments, methods to address PTW, methods for determining treatment and disposal requirements, requirements for rigid

containment) might be considered or allowed. EPA should explain how new data, including the "initial conditions" assessment will affect the selection of alternatives and the RAL boundaries based on current surface sediment concentrations. The FS should include language to allow for updates to risk assessments. EPA should incorporate decision frameworks for proposing equally or more effective capping options or other technology refinements based on detailed design-level evaluations and new data.

Specific examples of EPA's flawed approach for assignment of remedial technologies:
• EPA makes unsupported assumptions regarding nature and extent of contaminated groundwater discharge which drive inappropriate, prescriptive technology assignment decisions that fail to provide flexibility to develop appropriate site-specific designs and mandate use of potentially unnecessary materials (e.g. reactive amendments and/or cap armor).
• The FS fails to provide evidence supporting speculative assertions of groundwater impacts, and selectively ignores facts including the physical effects of upland controls on contaminant transport/mobility (i.e., significant reduction in advection) which would otherwise allow for remedial design that considers, and is compatible with, upland SCMs. Similar to EPA's treatment of riverbank areas (Item 18 below) arbitrary assumptions regarding nature/extent of contaminated groundwater are carried forward into the evaluation of alternatives and given weight for assessing the relative effectiveness of alternatives with respect to RAOs 4 and 8, which biases the outcome of alternative selection.
• While EPA's decision trees prescribe specific technologies amenable for use under heavy structures, it fails to consider the need for flexibility during design to adapt to any number of other site-specific constraints including slope stability, proximity to nearshore structures, etc. and preclude use of other technologies of potentially equivalent effectiveness.

EPA should modify the FS to clearly explain the conditions under which changes to major alternative elements might be considered, explain how new data will affect the selection of alternatives and the RAL boundaries based on current surface sediment concentrations, include language to allow for updates to risk assessments, and incorporate decision frameworks for proposing equally or more effective capping options based on detailed design-level evaluations and new data.

EPA Position:
The Respondent is confusing the requirements for an FS with the requirements for a ROD. The sole purpose of the FS is to develop remedial alternatives to be compared to each other in order to select a preferred alternative. The technology assignments in the 2016 FS are based on current information about the Site. The 2016 FS makes specific assumptions based on current conditions to develop remedial alternatives that can be compared to each other to inform remedy selection. Costs cannot be derived in the FS unless a technology is selected and evaluated. EPA used several lines of evidence based on site conditions described in the RI report to determine the appropriate technology to apply to various areas of the Site. The information and flexibility Respondents seek to be

discussed in the 2016 FS do not inform the evaluation of the NCP criteria and are more appropriately discussed in the ROD. Thus, EPA does not consider this a dispute issue for the 2016 FS.

LSS Dispute Issue 15 - Prescriptive dredge residuals management strategy

The prescribed application of 12-inches of sand across the entire dredge footprint (amended with AquaGate+PAC2 in areas where PTW present) is very poorly supported. The FS is misleading in stating that the placement of sand (and GAC in areas where EPA has speculated that PTW is present) immediately following dredging will eliminate the need for additional dredge passes. The FS indicates that sediment cores would be taken post-placement to verify thin-layer residual cover successfully reduces residuals concentrations. It is inappropriate to assume a 12-inch layer of residuals management cover will be applied across the entire dredge footprint, without providing a strategy that will determined the necessity for thin-layer placement and flexibility to develop an appropriate thickness.

As PAC can be toxic to benthic organisms, overall quantities, where and how it is applied warrants more thoughtful consideration. The FS neglects to consider the physical stability of PAC in the deployment of the thin-layer residuals cover. PAC will be ineffective if it immediately washes away. The FS neglects to consider any possible unintended consequences that may be posed by transport/erosion and aggregation of PAC (with, or without adsorbed contamination) in depositional areas. The assumed performance requirements for this residuals strategy are unclear.

The prescriptive dredge residual strategy should be removed from the FS. If left in, the strategy and rationale for the residual management approach should be clearly explained, and a flexible, objective approach to assessing the need for and approach residual management should be allowed.

2 The text makes numerous inappropriate references to specific commercial products (i.e., AquaGate+PAC, Aquablok) as components of the conceptual remedial design. The FS should provide flexibility to consider other commercially products for a given class of technologies.

EPA Position:

EPA made an assumption in the 2016 FS regarding the type and quantity of material to be used in dredge residual management in order to develop costs. The actual type and quantity of material needed for dredge residual management will be area-specific and determined in remedial design. However, EPA acknowledges that the use of a residual management layer can reduce costs of both post dredge sampling and multiple dredge passes to achieve remediation goals.

LSS Dispute Issue 16 - Inappropriate use of rigid containment technologies

EPA assumes the use of sheet pile barrier walls as dredge water quality control measures based on the suspected presence of NAPL will support the short term effectiveness of all

alternatives. The FS still fails to adequately evaluate the implementability, effectiveness and cost of this particular technology relative to other technologies and BMPs.

In making gross assumptions for this FS, EPA has disregarded the complexity of constructing such barrier walls (e.g. consideration of structural components such as king piles and structural bracing, or more complex cofferdam structures) and the associated impacts this will have on numerous aspects of remedy implementation ranging from construction duration (e.g. time required to install walls, and impacts to dredge production rates) to the overall net benefit and cost effectiveness relative to other means. EPA also continues to show figures that depict sheet piling in greater than 50 feet of actual water depth, which is technically infeasible. These figures also imply that sheet piles will be installed in the navigation channel, which would infeasibly obstruct vessel traffic. Sheet pile would also impact ongoing water dependent operations and nearshore fish migration does not evaluate whether sheet piles in the navigation channel could be permitted by USACE.

Because of the technical infeasibility of the use of sheet pile barrier walls, their consideration as a feasible technology for dredge water quality control measure should be removed from the FS.

EPA Position:
EPA disagrees that the use of sheet piles has not been adequately evaluated relative to other control technologies and BMPs. Sheet piles are a representative engineered rigid control measure identified and evaluated for sediment dispersion control in the 2016 FS. However, that representative approach does not preclude other types of rigid control measures for consideration during remedial design. As stated in the 2016 FS, Appendix O, EPA agrees that depth can limit the use of suitable engineered options for controlling releases, and deep water depths can preclude the use of sheet piles. EPA assumes that engineered rigid containment will be utilized when NAPL was present in water depths less than 50 feet.

Engineered rigid control measures were evaluated holistically within the 2016 FS for their use in reducing or eliminating short-term releases of contaminants during construction and not on a location-specific basis. Thus, the 2016 FS does not present figures indicating design level logistical details regarding location and depth of engineered rigid control measures. Location-specific evaluations for feasibility of sheet pile versus other types of engineered rigid control measures, including placement within the navigation channel, were beyond the scope of evaluation of the 2016 FS. Details regarding sediment dispersion control and location-specific engineered rigid control measures will be determined during remedial design which is the appropriate time for those types of evaluations.

Alternative-specific costs for purchasing, installing and removing sheet pile walls are presented in Appendix G of the 2016 FS. The unit costs were developed by the LWG in the draft 2012 FS on a horizontal linear foot basis. Quantities for sheet pile lengths used

in the detailed alternative cost estimates and presented in the 2016 FS, Table D2.j (in horizontal linear feet), were holistically estimated for each alternative by encircling all PTW dredge and/or capped areas with silt curtains assumed for the remainder of dredged and/or capped areas.

See EPA's position to LWG's dispute issue 2b regarding rigid containment.

The determination of technical feasibility of engineered rigid control measures is highly dependent on site specific conditions. As stated in Appendix O of the 2016 FS, EPA agrees that depth can limit the use of suitable engineered options for controlling releases, and deep water depths can preclude the use of sheet piles. However, blanket elimination of the technology is not warranted. EPA assumes that engineered rigid containment will be utilized when NAPL was present in water depths less than 50 feet.

LSS Dispute Issue 17 - Flawed evaluation used to determine whether PTW can be reliably contained

Notwithstanding Arkema's objection to EPA's definition of PTW, and assertion it is present offshore of the Arkema site, the approach used to determine applicable remedial technologies to address PTW in the draft final FS is flawed because it is based on a simplistic, overly conservative screening analysis and does not include standard engineering methods used to assess and ensure reliability. Additionally, EPA neglects to consider the current state of practice for reactive capping.

According to EPA, PTW is a concept used in the NCP to characterize contaminant source material (USEPA 1991). PTWs are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. In the 1991 guidance, EPA stated their expectation that PTW would be treated, wherever practical, because of current technical limitations of long-term reliability of containment technologies. The long-term reliability of containment of certain NAPL PTWs has improved through the development and implementation of reactive capping, as demonstrated by EPA (USEPA 2013). The draft final FS does consider and propose reactive capping but uses a flawed, simplistic screening analysis to limit its use through designating certain SMAs as PTW NAPL/NRC, reflecting those areas where purported NAPL is deemed not reliably contained (NRC). Furthermore, the draft final FS is not consistent with the EPA guidance on principal threat and low-level threat wastes (LTW) (USEPA 1991), as it does not differentiate PTW from LTW NAPL based on toxicity, mobility, and (realistic) reliability of containment, but uses NAPL and PTW interchangeably. For instance, for shallow areas it states that NAPL or PTW that is not reliably contained within an SMA would be dredged to the lesser of the RAL concentrations or 15 feet.

To determine the boundary for where PTW can be reliably contained, two limited capping options were modeled in Appendix D to determine the maximum concentrations of PTW material that would not result in exceedances of AWQC in the sediment cap pore

water after a period of 100 years. Contaminants modeled were chlorobenzene, dioxins/furans, DDx, naphthalene, PAHs, and PCBs. Appendix D contains the following errors or ommissions:

• The objectives of the analysis are not clearly identified. The document states "this appendix is evaluating whether or not PTW at the Site can be reliably contained under specific assumptions". However, at the end maximum containable sediment concentrations of 320 µg/kg and 140,000 µg/kg for chlorobenzene and naphthalene are presented;

• The two potential active cap designs modeled (thickness of capping layers and amount of active material in cap for a reasonably conservative approach and a more aggressive augmented capping approach) are not representative of the current state of practice for reactive capping and so cannot be used to determine the contaminant concentrations that cannot be reliably contained;
o The reasonably conservative approach (12-inch active layer containing 5% activated carbon by weight) is not applicable for NAPL sites. The example site referenced (Berry's Creek in New Jersey and Bailey Creek, Fort Eustis in Virginia) are likewise not NAPL sites. Additionally, Berry's Creek represents a very small pilot-scale test of reactive cap technologies.
o The more aggressive augmented capping approach (12-inch active layer containing 20% activated carbon by weight) is also not applicable for NAPL sites. Organoclay is a more applicable and effective amendment for NAPL site (McCormick Baxter and West Branch Grand Calumet River).
o GAC may have a greater absorption capacity than organoclay on an equivalent weight basis with regards to some dissolved phase contaminants, but it can easily be fouled by NAPL.

• The long term reliability of a reactive cap is a direct function of the thickness of the reactive layer and the amendment(s). A more reliable reactive cap with a thickness greater than 12-inches and consisting of a lower layer of organoclay and an upper layer of GAC should have been considered in Appendix D.

• Maximum porewater concentration of chlorobenzene used as a continuous source term in the model is based on the relatively old Remedial Investigation (RI) database and is not representative of current conditions, let alone for the next 100 years. In addition, EPA has used data that was not collected pursuant to the RI. EPA has used reconnaissance data collected using a Geoprobe rig. The data are unacceptable for and cannot be used to represent porewater chlorobenzene concentrations. Therefore, the maximum porewater concentration EPA used is based on inappropriate data and needs to be replaced in the model. Since the RI data collection, a barrier wall and pump and treat system has been installed along the shoreline of the Arkema site. It is anticipated that any remaining dissolved-phase chlorobenzene left beneath sediments (stranded wedge along toe of riverbank) will continue to naturally attenuate. Furthermore,

maximum data are no appropriate for assessing engineering performance, including reliability. A more appropriate input parameter is the 90th percentile concentration.

• *A range of seepage velocities were evaluated (0.3, 3, and 30 cm/day), representing the minimum, average, and maximum values measured at the Site. However, actual seepage velocities in SMA 7W are likely lower than 0.3 cm/day due to presence of barrier wall and pump/treat system.*

EPA should revise the active cap modeling calculations to be transparent and clearly explain the assumpions in the model, model the active cap layers using current state of practice assumptions, utilize realistic long-term source concentrations in the cap model, and use a range of seepage velocities.

EPA Position:
Consistent with the NCP and EPA guidance, PTW was identified based on a 10^{-3} risk, source material (NAPL) within the sediment bed. As noted in "A Guide to Principal Threat and Low- Level Threat Wastes" (Superfund Publication 9380.06FS, November 1991):

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. They include liquids and other highly mobile materials (e.g., solvents) or materials having high concentrations of toxic compound

EPA expects to use treatment to address the principal threats posed by the Site, wherever practicable, consistent with the NCP (40 CFR §300.430) and EPA guidance. However, based on the technology assignment process, if sediment classified as containing PTW is located in an area designated for capping, then a reactive cap will be assumed for that area to meet the preference for treatment and meet surface water applicable or relevant and appropriate requirements (ARARs). As such EPA determined what PTW may potentially be reliably contained based on modelling representative site conditions and capping options to determine the maximum concentrations of PTW material that would not result in exceedances of human health based water quality criteria. While modeling indicates that there may be an increase in the potential to control the material, it is not deterministic that that will in fact be the case for all portions of the site. As such, the modeling information is useful as part of the nine evaluation criteria, but it not relevant to the determination of PTW.

The 2016 FS relied on location specific technology assignments to develop remedial action alternatives for evaluation in the detailed and comparative evaluation of remedial alternatives. The technology assignment process considered site specific information such as water depth, current and future navigation uses, PTW, contaminated groundwater plumes, structures, wind and vessel wake generated waves, sediment deposition rate, sediment bed slope, the presence of cobbles, rocks and bedrock, propeller wash, debris,

and the vertical extent of contamination. Consideration of these site specific factors was conducted in a technically appropriate manner.

EPA relied on observations of NAPL to identify areas where NAPL may be present and employed a site-specific capping model to determine whether COCs at the Portland Harbor site can be reliably contained. As mentioned in Section 3.2.2.2 of the 2016 FS "This is an appropriate model to make FS-level decisions and is sufficiently rigorous to be used for decision-making at the FS phase. More rigorous modeling may be conducted as needed in remedial design." It should be noted that the identification of NAPL and not reliably containable material in sediments offshore of the Arkema site are not mutually exclusive. Rather areas identified as containing NAPL were also found to contain levels of chlorobenzene that were determined to be not reliably containable.

The 2016 FS also developed a series of generic cap designs that incorporate reactive materials. This includes the "significantly augmented reactive cap" that utilize organoclay mats and low permeability materials to contain NAPL and reactive caps that utilize particulate activated carbon (PAC) mixed with sand to a PAC concentration of 5 percent by weight to contain highly toxic PTW. These FS level cap designs are consistent with the application of reactive caps at contaminated sediment sites around the country including the McCormick and Baxter site in Portland, Oregon and the River Mile 10.9 removal action in Lyndhurst, NJ.

This comment misrepresents the cap designs utilized in the 2016 FS. The 2016 FS relies on a "significantly augmented reactive cap" for areas were NAPL will be left in place. The significantly augmented reactive cap relies on organoclay mats and low permeability materials to contain NAPL and consists of the following elements:

- Chemical Isolation Layer: 1-inch organoclay mat.
- Low Permeability Layer: 17-inch layer of fine grained sand or other low permeability material
- Physical Isolation Layer: 12 inches of sand.
- Stabilization Layer: 6 inches of armor stone.

Reactive caps are utilized for areas where highly toxic PTW will be left in place. As noted in the comment, activated carbon is not considered suitable for NAPL due to the potential for fouling.

Reactive caps rely on a 12 inch layer of sand and powdered activated carbon (PAC) at a concentration of 5 percent by weight to contain highly toxic PTW and consists of the following elements:

- Chemical Isolation Layer: 12-inch layer consisting of approximately 50 percent sand and 50 percent AquaGate+PAC.
- Physical Isolation Layer: 18 inches of sand.
- Stabilization Layer: 6 inches of beach mix or armor stone.

For the significantly augmented cap, an organoclay mat that is effectively equivalent to four times the amount of activated carbon typically placed in a cap was conservatively assumed. The conservative assumption of a low permeability layer, COC degradation and no deposition were also used in order to contain the maximum possible contaminant concentration with this cap. The use of an organoclay mat and an upper layer of GAC (or PAC) may be considered during remedial design.

The model was used to estimate the maximum concentration of chlorobenzene that can be reliably contained using the significantly augmented reactive cap. The effects of the barrier wall and pump and treat system can be used during remedial design activities.

Any seepage velocities being influenced by the presence of the barrier wall and pump-and-treat system should be empirically collected prior to design for the construction of a cap based on site-specific criteria. The range of seepage velocities evaluated in Appendix D of the 2016 FS were selected to better understand contaminant fate and transport under a range of conditions.

The assumptions used for this analysis are outlined in the 2016 FS, Appendix D, Section D7.4 and Section D7.5, and are in line with current state of practice. A range of seepage velocities were evaluated (0.3, 3, and 30 cm/day), representing the minimum, average, and maximum values measured at the Site. As noted above, seepage velocities that consider the presence of the barrier wall and pump and treat system may be considered during remedial design. The assumptions used for this analysis are explained as follows:

- a 12-inch active layer with “active layer loading of the augmented cap of 0.48 lb/ft2/cm” was assumed which is four times the amount of activated carbon typically placed in a cap
- “a low permeability layer limiting seepage velocity to 0.3 cm/day was assumed” to represent a conservative value for seepage velocity
- degradation was assumed to incorporate effects of degradation of chemicals due to the long residence time in the cap
- “No sediment deposition on top of the cap” was conservatively assumed
- No consolidation was assumed to take place in the cap or in the underlying sediment

<u>LSS Dispute Issue 18 - Riverbank contaminants adjacent to the Arkema Site</u>
PCBs are listed as a riverbank contaminant at Arkema, but have only been detected in small number of samples below the applicable screening levels (with one exception, one sample slightly exceeded a conservative bioaccumulative SLV). The FS references an attached riverbank database, but the database was not included. Consequently, LSS continues to have no way to verify any of EPA’s FS decisions regarding remediation of the river banks. Regardless, prior issues with EPA’s source control approach remain. Two key issues are (1) risk-based PRGs should not be established based on exposure pathways being evaluated as part of the upland source control evaluations under DEQ

and (2) that none of these upland media were evaluated in the BLRAs or RI. EPA's use of sediment PRGs for riverbanks, which were even applied to areas rarely submerged by the river and without considering fate and transport (e.g., attenuation), is technically unsupportable and inappropriate. Delineations of groundwater plumes and riverbanks, and a zero post-construction restoration time frame are arbitrary. There is a total lack of data and analysis as to what risk considerations are driving the specific remedial actions delineated (and therefore how such analyses will be refined in the design phase when further data/analysis is available) and what specific remedial actions will be implemented in which areas driven by those risks. This arbitrary delineation is then carried forward into the evaluation of alternatives and used to assess the relative effectiveness of alternatives. This appears to significantly bias the outcome of alternative selection.

Source control measures taken at the Arkema Site have largely eliminated the stormwater pathway from this site. Groundwater controls, namely the installation of a slurry wall and a groundwater extraction and treatment system designed to prevent migration from the uplands to the river, have eliminated the groundwater pathway.

The June 2016 FS fails to include a discussion of upland source controls that have been implemented as well as failing to include anything related to the performance of source controls in the remedial evaluations.

The FS report should be modified to include appropropriate risk-based PRGs developed for riverbanks rather than sediments and should acknowledge and include a discussion of upland source control measures in the remedial evaluations.

EPA Position:
See EPA position to LWG dispute issue 1q.

LSS Dispute Issue 19 - Updates to risk assessments
The FS should include language for allow for changes in pre-design work, to allow for updates to risk assessments. For example, if sediment and/or fish tissue samples are collected which show concentrations less than target levels, then PRGs/RALs would need to be revisited. Similarly, if additional studies on benthic toxicity are conducted for a portion of the river, those results should be used to update the remedial footprint for RAO5. Several source control actions have been undertaken and completed since the RI dataset was collected. Thus, areas of the river, COCs and media previously shown to show unacceptable risk may no longer show risk. Thus, a remedy may not be necessary to address some or all RAOs where such changes have occurred. Furthermore, as noted above, background levels are not well defined based on the RI dataset and need to be updated and re-assessed to develop more robust background values. Because many of the COCs have PRGs based on or very close to background levels, as currently defined, an improved understanding background conditions is key to a successful remedy. Otherwise, predicted risk reductions, which are already minimal, will not be realized. The potential outcome is a high cost remedy which provides no public benefit.

Section 2.2 of the FS only states: "Achieving the above RAOs relies on remedial alternatives' ability to meet final remediation goals/cleanup levels derived from PRGs. At this point, Table 2.2-1a-d provides PRGs that are based on such factors as risk, ARARs, and background. Section 2.2 of the FS also states "PRGs may be further modified through the evaluation of alternatives and the remedy selection process. Final cleanup levels will be selected in the Record of Decision." Yet, there is no other mention of the process in the FS.

EPA should modify the FS to clearly describe data gaps and uncertainties that can be addressed during design, including listing anticipated pre-design and design studies, developing robust background values and using any new measured data, and the process for modifying PRGs and remedies based on these studies.

EPA Position:
Within the main text of the 2016 FS there are 26 instances where collection of additional data to assist remedy design and flexibility in refining the remedy during the remedial design process is discussed. EPA is not aware of a prescriptive number of how many instances this must be mentioned before it may be considered sufficient. The data gaps and uncertainties that can be addressed during design, including anticipated pre-design studies, is appropriately discussed in the ROD, not in the FS. [See EPA's *A Guide To Preparing Superfund Proposed Plans, Records Of Decision, And Other Remedy Selection Decision Documents* (OSWER 9200.1-23P), *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (OSWER Directive 9355.3-01), and *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (OSWER 9355.0-85)] Thus, modifications to the FS to incorporate this information are not appropriate.

LSS Dispute Issue 20 - Evaluation of MNR
The Monitored Natural Recovery (MNR) evaluation is insufficient to support the alternatives evaluation. The FS continues to omit key components of an MNR evaluation as required by guidance (such as EPA's 2005 sediment remediation guidance) including: 1) an adequate CSM; 2) appropriate evaluation of multiple lines of empirical evidence; and 3) a quantitative evaluation of natural recovery and the associated long-term (i.e., after "time zero") outcomes of the alternatives. New concerns with this FS include:

• *EPA added new information on bathymetry changes and fish tissue. In Section 3.6.1.3, EPA's updated evaluation of fish tissue concentrations over time completely ignores 2012 data without any explanation.*

• *EPA states that, "Therefore, a minimum deposition rate of 2.5 cm/year was assumed as the criteria [sic] for effective MNR." This criterion is obviously not used by EPA in the FS because the FS assumes MNR as the applicable technology for all areas outside SMAs (as opposed to applying MNR in just areas exceeding the minimum deposition rate).*

Although we agree with the wide application of MNR, EPA's explanation of its MNR evaluation process is full of inconsistencies and errors.

• *Rather than assuming an effective conceptual framework that will incorporate new information and adjust the assignment of MNR to specific areas during design, the FS focuses on minor challenges affecting one, of multiple, lines of evidence used to assess natural recovery rates (i.e. EPA emphasizes the challenge in assessing deposition rates for the shallow region using bathymetric data - given an assumed inability for survey boats to maneuver and obtain quality data.) In its biased presentation of this matter, EPA ignores multiple lines of evidence that can, and should, be used to reduce uncertainties during design and be used to refine technology assignments.*

EPA Position:
The Respondent does not provide any information as to why the CSM described in the RI Report produced by the LWG is inadequate. EPA significantly modified and approved the RI Report that meets the requirements of the NCP and EPA guidance and policy. Also, as stated in Section 3.6.1.3 of the 2016 FS, EPA did use the 2012 fish data in evaluating MNR. As stated in the 2016 FS, MNR is both deposition and dispersion; thus, MNR is applied to all low concentration areas, not just areas exhibiting a certain deposition rate. EPA looked at areas of deposition (see Appendix D8) to determine if enough deposition would occur in various areas of the Site using the deposition rates for each 10 ft x 10 ft pixel to mix and reduce remaining sediment concentrations to acceptable concentrations. As stated above, the 2016 FS developed alternatives based on currently available information and does not discuss what should be in a ROD for future evaluation.

IV. UPRR DISPUTE STATEMENT RESPONSE

UPRR Dispute Issue 1 – Overarching Concern
Under the Comprehensive Environmental Response Compensation and Liability Act ("CERCLA"), 42 U.S.C. § 9601 et seq., and its implementing regulation, the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300, EPA is required to use a specified framework and particular criteria for identifying and evaluating cleanup alternatives to address unacceptable risks posed by hazardous substances. EPA's national sediment guidance documents explain how the NCP framework should be utilized at sediment megasites.

While EPA has substantial discretion in how it evaluates cleanup alternatives and identifies a preferred alternative using the nine criteria for FS evaluations set forth in 40 C.F.R. § 300.430(e), the cleanup goals must be achievable through the implementation of the selected cleanup. Contaminated Sediment Remediation for Hazardous Waste Sites, December 2005
("Sediment Guidance').

Such is not the outcome of the FS for the Site. In failing to comply with requirements for evaluating cleanup alternatives in a FS, as described in more detail below, EPA Region

10 has generated a preferred alternative that requires attainment of a total PCB cleanup goal that is not achievable and sustainable, is far more disruptive than described by EPA, will take much longer to implement than predicted by EPA, will likely cost significantly more than estimated by EPA, and is therefore not cost-effective as required by the NCP. Further, the FS does not identify which areas currently pose the highest risk and should be prioritized for remediation.

This result is inconsistent with one of the fundamental principles of the Superfund program as expressed in the NCP Preamble: " ... this process [the remedy selection process] considers the full range of factors pertinent to remedy selection and provides the flexibility necessary to ensure that remedial actions selected are sensible, reliable solutions for identified site problems." 55 FR 8700 (March 8, 1990).

The LWG's draft FS fulfilled the requirements of the law and EPA guidance, proposing a workable, common sense cleanup. EPA's unnecessary and inappropriate takeover of the FS from the LWG has diminished the quality and value of the FS. The LWG's 2012 draft FS incorporated reliable science, provided the required comparative analysis of alternatives, and relied on realistic estimates of cost and time necessary to perform work. The LWG was prepared to fully engage with EPA and resolve EPA's comments and concerns in order to produce a report that provided a credible basis for EPA's selection of a remedy that conformed to CERCLA, the NCP, and EPA guidance. EPA's unwarranted deviation from the RI/FS process agreed to by EPA in 2001 was an abuse of discretion and will not lead to an effective and timely cleanup.

Cleanup projects that are estimated to cost hundreds of millions, if not billions, of dollars must be evaluated and selected based on how effectively they will perform in the physical world. At this Site in particular, the impact of fast-flowing river dynamics on the schedule and cost of remediation are not sufficiently evaluated in the FS.

Union Pacific disputes the FS as a whole because it leads to a proposed cleanup project that has not been sufficiently evaluated as required under the NCP and has no realistic chance of being implemented as described by EPA. Union Pacific also disputes the determination that certain sediments in the vicinity of its railyard (the "Albina Yard") require remediation. Further specific bases for Union Pacific's dispute of the FS are set forth in the paragraphs below.

EPA Position:
See EPA's position to LWG's requested relief #2.

UPRR Dispute Issue 2 - EPA's PCB Cleanup Goal is Not Achievable
The preliminary remediation goal ("PRG") for total PCBs in the FS is nine parts per billion ("ppb"). The basis for this value is that it is the "background" value determined by

EPA in the Rl. The cleanup goal for PCBs is highly significant because PCBs are driving over 90 percent of the risk at the Site.

Union Pacific disputes both that the background number is achievable at the Site and that it should be used as a cleanup goal. Neither CERCLA nor the NCP authorizes EPA to select cleanup goals that are not achievable. EPA's guidance states the FS should confirm that cleanup goals are achievable by the sediment cleanup itself. Sediment Guidance, page 2-15.

In section 7.2.2 of the Rl, the upriver reach of the lower Willamette River extending from RM 15.3 to 28.4 was selected as the reference area for determining PCB background sediment concentrations. Although separated from the Site by anywhere from four to 17 miles, EPA chose this area because it is considered broadly representative of the upstream sediment loading to Portland Harbor. Based on its evaluation of data from this reference area, EPA determined the background concentration for PCBs for the Site is nine ppb.

The Lower Willamette Group disputed how EPA evaluated the data in determining background. In his letter dated March 24, 2015, denying the dispute, Richard Albright, the then current Director of the Superfund program in Region 10, wrote at page 16:

I would like to emphasize that as noted by EPA's Response at p. 24, there are sources of contamination outside of the Site - both upriver of the Site and within the downtown reach - that may affect the ability of the cleanup efforts within the Site to equilibrate to the selected cleanup level regardless of whether the cleanup level is based on risk, regulatory standard or background. In this regard, the Site is similar to other urban sediment sites which CERCLA addresses like the Lower Duwamish Site in Seattle.

If the Site cannot "equilibrate" to nine ppb, the cleanup level will not be achieved by the sediment cleanup action. The LWG submitted comments to EPA explaining how equilibrium, not background, should be used to establish PRGs and evaluate FS alternatives. The final FS appears to disregard all of this information.

Perhaps the most reliable certainty at the Site is that the Lower Willamette River continuously flows in one direction, from south to north, without pause or deviation. As part of the flow, the river carries sediments, much of which are deposited within the Site. Equilibrium is the result, in part, of concentrations of contaminants in the incoming sediments from upstream. As strongly suggested by Rick Albright, active remediation within the Site cannot achieve concentrations lower than that of the equilibrium level.

The LWG estimated equilibrium concentrations based on existing Rl empirical data, including deposited surface sediment data (from depositional areas upstream of the Site and from depositional areas within the upper reaches of the Site but apart from known source areas), sediment trap data, upstream suspended sediment data, and smallmouth bass fish tissue data from 2002, 2007, and 2012. The result of the LWG's evaluation of

empirical data, which was presented to EPA in August 2014, is that the equilibrium value for total PCBs should be 20 ppb. The LWG advised that EPA should not select risk-based PRGs below equilibrium values, including for PCBs. EPA's failure to do so, and failure to explain why the FS does not incorporate any evaluation of equilibrium, is inconsistent with the reasoning of its own former Director and an array of real-world data, and undermines the presumption that its proposed cleanup goal for total PCBs is realistically achievable.

Further, EPA's failure to use reliable models to reasonably predict when cleanup goals will be attained is another significant omission in the FS. In effect, EPA has not included any credible information in the FS indicating that its cleanup goals, particularly for PCBs, are actually achievable and sustainable over the long-term at the Site. The importance of models (e.g., sediment transport model and bed composition model) in making cleanup decisions at sediment sites is explained in detail in the Sediment Guidance, section 2. 9. Such models are generally used at large sediment sites (e.g., Lower Duwamish and Lower Passaic sites}, but were not used here.

Union Pacific disputes both that the cleanup goal for PCBs is achievable at the Site and that it is consistent with the NCP.

EPA Position:

While UPRR alleges that EPA chose the upriver reach from RM 15.3 to 28.4 as the "reference area," the administrative record for this site clearly indicates that the LWG chose this area, in consultation with EPA, DEQ, and the tribes. EPA does not discount the presence of possible in-water PCB sources upstream of the current Site boundary at RM 11.8, or of potential upland sources. However, the assumption in the 2016 FS is that those sources would be controlled and DEQ has represented that it will have significant upstream sources addressed. [See DEQ's 3/25/16 updated summary report **(AR Doc ID # 1000019892)**, Section 4.7, and their presentation to the NRRB, **(AR Doc ID 100002728)** at Slide 16.] It is EPA's expectation that potential sources will be controlled through DEQ's source control efforts under State authority, or if necessary by EPA using its CERCLA authority. Thus, background concentrations as represented by the deposited sediment concentrations exhibited in the "reference area" remain the best predictor of achievable cleanup goals for the Site, particularly given the unreliable nature of the predictions from the LWG's sediment fate and transport model (see 2016 FS Section 4.1.2 and Appendix H). The sediment data for Portland Harbor is replete with a large signature of PCB concentrations at or less than the PRG of 9 ppb, which would not be possible if the LWG's "equilibrium" theory were credible (Figures 5.2-1 and 5.2-2 in the final RI report). In addition, EPA notes that the assertion that "the most reliable certainty at the Site is that the Lower Willamette River continuously flows in one direction, from south to north, without pause or deviation" is not true and is directly contradicted by information presented in the LWG's own reports submitted to EPA, which clearly note that Portland Harbor is subject to tidal influence and also documents flow reversals from the Columbia River backing up the Willamette during flooding or high water events through at least the downtown reach. Lastly, UPRR overstates that

EPA's sediment guidance emphasizes the "importance of models"; a more correct characterization of the guidance is that the models can be useful. However, the lack of the proper time-series data, as acknowledged in the LWG's draft 2012 FS, prevented validation of a sediment transport model for Portland Harbor.

UPRR Dispute Issue 3 - Risk Management is Absent from FS Evaluation

Another fundamental flaw in the FS is the absence of credible risk management. Risk management in the Superfund program requires the consideration of the advantages and disadvantages of cleanup alternatives and a balancing of trade-offs. This analysis includes an evaluation of the uncertainties at the Site, including uncertainties in the reliability of the exposure data used to identify the risks. 40 C.F.R. § 300.430(e)(2)(i)(A)(4). Further, as noted in the NCP Preamble, "[t]he likelihood of the exposure actually occurring should be considered when deciding the appropriate level of remediation, to the degree that this likelihood can be determined." 55 FR 8710 (March 1990).

As described in the Sediment Guidance: "A risk management process should be used to select a remedy designed to reduce the key human and ecological risks effectively." Sediment Guidance, page 7-1. It is telling that the term "risk management" is never used in the FS.

At Portland Harbor, the risk assessments, particularly for human health, are built on a cascade of conservative assumptions regarding exposure and durations. Unacceptable risks to various consumers of fish are based on questionable assumptions of how many fish people eat, from which areas of the river, how the fish are cooked, and for how many years. Contrary to the NCP, the assumptions were not placed in an overall estimate that is conservative but within a realistic range of exposure as required by the NCP. NCP Preamble, 55 FR 8710. Further, the assumptions used at Portland Harbor are not compared to assumptions used at other sediment megasites (i.e., nowhere is there an explanation why people are more exposed to certain kinds of risk in Portland than they are in Seattle or Newark, for example).

Of equal importance is that EPA's FS fails to document how the risk assumptions have been considered when evaluating alternatives. The FS describes what appear to be highly exaggerated risks at the Site. For example, the acceptable consumption rate is 6 fish meals every 10 years. EPA does not provide backup for how meals per 10 years were calculated or how it is consistent with the baseline risk assessment. Nor does EPA clarify whether resident fish caught from any location within the 10-mile river contribute to potential excess risk. In the absence of such information in the FS, it is not apparent that the reliability of the exposure assumptions has been sufficiently considered (i.e., whether an important element of risk management has even been conducted).

Finally, the FS does not identify which areas currently pose the highest risk and should be prioritized for remediation. At a 10-mile Site that, according to the FS, encompasses nearly 300 acres requiring active remediation and likely close to 20 years to perform the

cleanup, it would seem necessary and prudent to establish a basis for prioritizing and sequencing the cleanup of the higher risk areas. EPA's failure to do so is an indication that it is not effectively managing the risk.

Union Pacific asserts EPA has failed to comply with regulations and guidance because the FS fails to document that EPA included a legitimate risk management step in its evaluation and decision-making process. The absence of risk management means EPA has not demonstrated the preferred alternative represents the most appropriate solution for the Site.

Union Pacific disputes that the FS incorporates risk management as required by the NCP.

EPA Position:
UPRR's issues with the BHHRA and the exposure assumptions used were the subject of a previous formal dispute by the LWG under the AOC. EPA's position and determination of the appropriateness of the assumptions used for the Portland Harbor Site was documented in the final ECL Director decision and supporting administrative record. **[AR Doc ID # 1432316 and 715198]**

In the 2016 FS, EPA used equations B3-15 and B3-16 to calculate fish meals and solved for the consumption rate (CR). These are the same equations used to establish risk in the BHHRA.

Lastly, regarding UPRR's assertion that the FS was not clear about how risk management was applied in evaluating the alternatives, the NCP and EPA guidance state that risk management should be used in selecting a remedy. EPA did not select a remedy in the 2016 FS; thus, did not discuss risk management in selection of a remedy. The Preferred Alternative was discussed in the Proposed Plan and the final remedy will be selected in the ROD.

UPRR Dispute Issue 4 - The FS Requires More Sediment Removal Than Necessary
"Principal threats are characterized as waste that cannot be reliably controlled in place, such as liquids, highly mobile materials (e.g., solvents), and high concentrations of toxic compounds (e.g., several orders of magnitude above levels that allow for unrestricted use and unlimited exposure)." NCP Preamble at 55 FR 8703.

In the FS, EPA has designated large areas of sediments with relatively low concentrations as principal threat waste ("PTW") (e.g., above 200 ppb total PCBs) that must be removed from the Site, including near Union Pacific's Albina Yard. However, the FS fails to explain satisfactorily how sediments in these large areas are highly mobile or highly toxic and how they cannot reliably be contained in place.

The FS does not contain a credible conceptual site model that identifies the extent to which certain areas of sediments are "highly mobile" and need to be removed. Most

areas of the Site are depositional, meaning that sediments in these areas are stable and likely to remain in place in the future. In many cases, where contaminant concentrations in surface sediments in these areas represent an unacceptable risk, such sediments can be reliably contained in place.

Nor are the PCB levels in the river "highly toxic". In the risk assessment, EPA identified unacceptable risks based on fish consumption, which is an indirect exposure pathway (i.e., people are not eating contaminated sediments). Consistent with acceptable risk assessment methodology, exposure assumptions were averaged over time and space to best represent potential indirect exposure to people eating fish. The exposure units for the fish consumption pathway ranged from site-wide to individual EPA river miles, depending on the home range of the fish species.

In its designation of PTW, however, the FS disregards acceptable methods for assessing indirect risk and identification of PTW thresholds. In the FS, any sediment that exceeds 200 ppb PCBs is deemed PTW. The FS does not explain or justify why sediment at such a relatively low concentration is "highly toxic" (i.e., several orders of magnitude above levels that allow for unrestricted use and unlimited exposure). At many other sediment megasites around the country, EPA's cleanup level for total PCBs is 1 part per million. Sediment containing PCBs at 200 ppb is one-fifth of what is considered an acceptable cleanup level at these other sites. The FS's designation of "highly toxic" material at Portland Harbor is without basis, contrary to policy and practice elsewhere, and clearly not reasonable.

Further, as the LWG has explained to EPA, EPA's decision to cap, rather than remove, more highly contaminated sediments associated with the McCormick-Baxter site is inconsistent with its current position on treating principal threat waste elsewhere at the Site.

Union Pacific disputes EPA's designation of principal threat waste at the Site.

EPA Position:
See EPA position to LWG dispute issue 2c.

EPA did not establish a requirement for removal of principal threat waste in the 2016 FS. Technology assignments were made in the 2016 FS based on area-specific environmental conditions discussed in Section 3 of the 2016 FS. Contaminated sediment identified as principal threat waste was only further evaluated for treatment as discussed in both the NCP and EPA guidance.

UPRR Dispute Issue 5 - The FS Substantially Underestimates the Impacts of Performing, and the Time and Cost to Perform, the Preferred Alternative
One of the key FS evaluation criteria in the NCP is short-term effectiveness, which requires consideration of the effects of the alternative during the construction and implementation phase until remedial response objectives are met. 40 C.F.R.

§300.430(e)(9)(iii)(E). At sediment sites, short-term risks associated with capping and dredging may include potential contaminant releases during such operations (which may increase fish tissue concentrations) as well as accidents to workers, disruptions to business and recreational uses, and other impacts to the community (e.g., from light, noise, and air emissions). Sediment Guidance, at page 7-9. At a site where the cleanup will take many years to perform, a realistic evaluation of the time to perform the cleanup also needs to be incorporated into the evaluation of short-term impacts.

The FS does not include a reasonable quantification of the above-described short-term impacts, such as realistic estimates of the extent of dredge releases (e.g., water quality impacts). For each more aggressive alternative, the FS simply says the short-term impacts will be "greater."

EPA Position:
There is nothing in EPA guidance (1998 or 2005) that requires quantification of short-term impacts. The guidance states that these impacts should be identified and the trade-off between alternatives discussed. The impacts are the same for all alternatives (except the no action alternative), the only difference is that the impacts are longer due to the increased construction duration with each alternative. Section 4.3.5 of the 2016 FS discusses the trade-offs for short-term effectiveness between alternatives. EPA states that the impacts for any alternative will be for 4 months per year and last the duration of the construction project. EPA quantified the construction period of each alternative and as the construction of the project increases, so would the impacts.

Moreover, the NCP requires not only an assessment of individual alternatives against each of the nine criteria but also "a comparative analysis that focuses upon the relative performance of each alternative against those criteria." 40 C.F.R. § 300.430(e)(9)(ii). The socalled comparative analysis in the FS is oversimplified and does not attempt to meaningfully consider the trade-offs between increasing short-term impacts and the alleged benefits of more expansive dredging and capping requirements. If, for example, the water quality impacts (and associated impacts to fish tissue concentrations) from dredging are increasingly significant as the extent of dredging and capping increases, then there should be corresponding increases in the benefits from performing such increasingly more aggressive approaches. However, the FS does not include a credible explanation of how the preferred alternative's combination of active remediation and monitored natural recovery achieves cleanup goals in a substantially shorter time than less aggressive alternatives using a different combination (i.e., more monitored natural recovery). The required balancing of trade-offs under the NCP is conspicuously absent from the FS.

EPA Position:
The comparative analysis conducted in the 2016 FS is consistent with the requirements of the NCP and EPA's guidance (cite to FS and sediment guidance). Increases in fish tissue concentrations due to dredging would only occur during the four month construction period. The increases would localized to where the dredging occurs and would be far less

than the exposure during the high flow periods. Longer periods of dredging result in longer exposure in the site as a whole, as discussed in the 2016 FS, but tissue concentration would not increase because of the localized nature of the dredging and home range of the fish. Since all the alternatives include dredging in the same localized areas of the Site, the effects from dredge releases would be fairly indistinguishable between alternatives. At other sites, fish tissue concentrations have been shown to increase during dredging operations and then decrease substantially within a year of construction completion.

Respondents are referring to remedy selection criteria. A preferred alternative is not selected in the 2016 FS. The preferred alternative is discussed in the Proposed Plan, which is not subject to the dispute provisions under the AOC.

In addition, the FS is wildly optimistic about the estimated time to perform each of the alternatives. In October 2016, the Port of Portland ("Port"), which has extensive experience with dredging projects, participated in a meeting with Jim Woolford, the head of EPA's national Superfund program, and explained that EPA's estimates of construction duration and cost were not reasonable and needed to be revised. On October 13, 2015, the LWG provided Mr. Woolford a memo which incorporated the Port's analysis (Enclosure 1). The FS fails to incorporate the Port/LWG's estimates and does not explain why it disagreed with them. Based on the memo, which incorporated the Port's real-life experience with dredging projects, it is very likely that the magnitude and duration of short-term impacts associated with the cleanup are substantially underestimated in the FS.

EPA Position:
See EPA's position to LWG's dispute issue 1f.

Further, as noted in section 2 above, EPA's failure to use reliable models to predict when cleanup goals will be attained is a fundamental flaw in the FS. For example, Page ES-16 of the FS states as follows: "Alternative I achieves more interim targets than Alternative D and is therefore more reliable in achieving PRGs and RAOs in a reasonable time frame because it relies less on natural processes."

But there is no information in the FS that supports the apparent assertion that Alternative I will achieve PRGs and RAOs more quickly than Alternative D. In the absence of a reasonable basis to compare the time frames in which the cleanup goals will be attained, the trade-offs between increased short-term impacts and the long-term benefits of the cleanup cannot be made as required under the NCP.

EPA Position:
As stated in the 2016 FS, no reliable model of the lower Willamette River exists because Respondents did not collect data necessary to support development of a reliable model. If respondents wanted to use a reliable model, then they should have collected the necessary data identified in EPA guidance (2005) to support the development of a reliable model.

Further, EPA's guidance does not require that a model be used, acknowledges that the use of any model in this type of system is highly unreliable in estimating recovery time frames, and only states that models are helpful in relating one alternative to another. There is no model that has the ability to predict with any certainty that these processes will occur in precisely some time frame. Models can only be used to show how alternatives perform relative to each other.

EPA has enough information in the CSM to understand that MNR processes are occurring in the lower Willamette River. Cleaner sediments from upriver continue to move into the Site, mix with the contaminated sediment, and transport to the Columbia River and out to the ocean. There is very little area within the Site that is constantly depositional (see 2016 FS Appendix D8), thus MNR is going to happen through deposition, mixing and dispersion. Logically, if there is a lower residual concentration in an area of the Site, then it will take less deposition, mixing and dispersion, and thus, less time, to reduce the contaminated sediments concentrations in order to reach the desired remediation goals. Since each of the Alternatives A through H progressively increase in the area capped or dredged, the remaining sediment concentrations would be progressively lower, as shown in the following example:

	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G	Alt H
Acres cap/dredge	0	95	117	177	269	505	756	2,167
PCB SWAC (µg/kg)	208	74	NA	56	40	23	17	9

(values taken from 2016 FS Tables 3.8-3 and J2.3-1)

Since MNR is through dilution and the rate would be the same for all alternatives, the lower the post-construction SWAC, the faster the dilution to the desired goal would be. For example, if the dilution rate was 10 µg/kg per year, it would take 20.8 years for Alternative A to reach the goal, 7.4 years for Alternative B, 5.6 years for Alternative D, etc. However, the actual dilution rates vary greatly throughout the site and are currently unknown, so a quantification of the actual dilution rates and times cannot be quantitatively computed with any accuracy. Thus, this evaluation could only be made qualitatively.

Another significant omission in the FS is the absence of information to support the statutory determination of cost-effectiveness. As explained in the dispute letter submitted by a group of AOC signatories, significant categories of costs are either underestimated (e.g., engineering design, waste processing, water treatment, sheet pile barriers) or

completely absent (e.g., pre-design investigation, agency oversight, and Oregon Department of State Lands fees for access, leases, and easements).

Second, the FS fails to examine and compare the relative magnitude of cost to effectiveness of each alternative individually and the cost and effectiveness of alternatives in relation to one another. See NCP Preamble at 55 FR 8728.

EPA Position:
See EPA's position to LWG's dispute issue 2b.

The LWG has submitted many comments to EPA about deficiencies in the draft FS. Most of the deficiencies remain unaddressed. Issues associated with the evaluation of shortterm effectiveness, cost, and time are among significant concerns. However, just these concerns alone demonstrate a substantial weakness in the required evaluations in the FS and significantly impair any representation by EPA in the FS that the preferred alternative represents the best balance of the cleanup evaluation criteria.

Union Pacific disputes that EPA's evaluation of short-term impacts, cost-effectiveness, and time for construction of the cleanup are reasonable and in accordance with the NCP.

EPA Position:
EPA considered all the issues previously raised by the LWG, and addressed all the issues raised by the LWG that needed to be addressed. Although the LWG may not agree with EPA's final decision on a particular issue does not mean that EPA did not address their issues.

UPRR Dispute Issue 6 - Sediments Near Albina Yard Do Not Require Cleanup
The FS preferred alternative identifies two areas of sediments between RM 10 and 11 that EPA has identified for cleanup, purportedly due to exceedances of the PCB remedial action level ("RAL"). EPA also identified these areas on Figure 3.2-3 as containing principal threat waste. This area of the Site is near Union Pacific's railyard at Albina Yard. Union Pacific disputes this determination, particularly the area from approximately RM 10.7 to RM 11 where there are no exceedances of the applicable RAL in surface or subsurface samples of sediments.

EPA's potential cleanup area near RM 10.7 appears to be based on a PCB exceedance in soil at one location on a 900-foot stretch of the riverbank. EPA included riverbanks as part of its draft FS evaluation of alternatives, but did not identify Albina Yard as a site with "known contaminated riverbank" in section 1.2.3.5 of the FS.

Moreover, in its Final Remedial Investigation/Source Control Measures Evaluation Report for Albina Yard dated November 2010, which was reviewed and approved by Oregon DEQ, Union Pacific determined that the riverbank near Albina Yard had a low potential for erosion because it was highly vegetated and stabilized with rock/rip rap. Because PCB concentrations in the sediments are below the applicable RAL, and the

riverbank is stable, this area of sediments should not be included as a potential cleanup area. Certainly, the FS contains no explanation for this area's inclusion as a potential cleanup area, much less as an area containing principal threat waste.

Union Pacific disputes the apparent determination that sediments near RM 10.7 require remediation and, for the reasons explained in detail in section 4 above, the designation of such sediments as principal threat waste.

EPA Position:
The 2016 FS does not identify a preferred alternative. Further, EPA only developed SMAs based on extrapolations of existing sediment data that exceeded RALs, not river bank data. As Respondents point out, the river bank at Albina is not listed as contaminated. The SMA Respondent refers to is an artifact of the computer interpolation process, like many of the other small areas on the site. Because boundaries were not used in the computer interpolation process, this SMA is actually based on the high concentration sample data upstream from that location. EPA confirmed that there are not currently any samples in this cove that exceed RALs until more instream away from the shore at the Alternative H level, which is why there is an SMA strip outside the cove. The 2016 FS is not a design document and the footprints of the SMAs are based on extrapolations of RI/FS data, not design level data, and should not be used as absolute boundaries for SMAs. They are merely to identify at this stage of the process the cost estimates of remedial technologies to be used at the site in order to conduct a comparative analysis. Sampling conducted in remedial design will determine the boundaries for SMAs for active remediation.

UPRR Dispute Conclusion
Sediment megasites like the Portland Harbor Site are extremely challenging -challenging to characterize the contamination and the dynamics of the river system, challenging to identify what are the significant risks, and challenging to evaluate alternatives to reduce such risks. Union Pacific appreciates the hard work, resources, and dedication EPA has devoted to the Site prior to and since the Site was added to the National Priorities List in 2000.

Nonetheless, Union Pacific is concerned that because EPA's FS does not comply in significant ways with regulatory requirements and guidance recommendations for sediment megasites, EPA's description of a preferred alternative is not realistic and will not achieve protection of human health and the environment for a reasonable cost and within a reasonable time frame. Union Pacific looks forward to further communication with EPA as its dispute of the FS is considered by EPA.

EPA Position:
EPA has responded to the specific issues raised by Union Pacific. The 2016 FS was developed with EPA’s experts at headquarters and reflects feedback and the support provided overall on the content and analysis contained in the 2016 FS, as well as recommendations made by EPA’s expert panels for CERCLA remedies and sediment

sites (NRRB and CSTAG). Union Pacific has not provided any specific or credible evidence to support that the FS does not comply with the NCP and EPA guidance.

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ENCLOSURES

Table 2.2-2
Summary of COC Selection Process
Portland Harbor Superfund Site
Portland, Oregon

Contaminant	CAS RN	BERA	BHHRA	Identified as a COC	Rationale for Including/Eliminating
Acenaphthene	83-32-9	X		Y	Evaluate as PAH
Acenaphthylene	208-96-8	X		Y	Evaluate as PAH
Aldrin	309-00-2	X	X	Y	Human health: shellfish
Aluminum	7429-90-5	X		N	Not ecologically significant
Ammonia	7664-41-7	X		N	Ammonia only has an HQ=3 based on FPM, which does not reliably predict sediment toxicity for individual contaminants.
Anthracene	120-12-7	X		Y	Evaluate as PAH
Antimony	7440-36-0	X	X	N	Infrequent and/or anomalous detections in fish
Aroclor 1254	11097-69-1	X		N	Evaluate as PCBs
Arsenic	7440-38-2	X	X	Y	Human health: beach, sediment, water, fish/shellfish Known groundwater plumes at site.
Barium	7440-39-3	X		N	Not ecologically significant
Benzene	71-43-2	X		Y	Known groundwater plume at site.
Benzo(a)anthracene	56-55-3	X	X	Y	Human health: beach, sediment, water, fish/shellfish Evaluate as cPAH and PAH
Benzo(a)pyrene	50-32-8	X	X	Y	Human health: beach, sediment, water, fish/shellfish Evaluate as cPAH and PAH
Benzo(b)fluoranthene	205-99-2	X	X	Y	Human health: beach, sediment, water, fish/shellfish Evaluate as cPAH and PAH
Benzo(g,h,i)perylene	191-24-2	X		Y	Evaluate as PAH
Benzo(k)fluoranthene	207-08-9	X	X	Y	Human health: beach, sediment, water, fish/shellfish Evaluate as cPAH and PAH
Benzyl alcohol	100-51-6	X		N	Not ecologically significant
Beryllium	7440-41-7	X		N	Not ecologically significant
Bis(2-ethylhexyl) phthalate (BEHP)	117-81-7	X	X	Y	Human health: fish Ecologically significant contaminant
Cadmium	7440-43-9	X		Y	Ecologically significant contaminant
Carbazole	86-74-8	X		N	Not ecologically significant

Table 2.2-2
Summary of COC Selection Process
Portland Harbor Superfund Site
Portland, Oregon

Contaminant	CAS RN	BERA	BHHRA	Identified as a COC	Rationale for Including/Eliminating
Carbon disulfide	75-15-0	X		N	Not ecologically significant
Chlordane	57-74-9	X	X	Y	Human health: fish Ecologically significant contaminant
cis-Chlordane	5103-71-9	X		N	Evaluate as chlordane
Chlorobenzene	108-90-7	X		Y	Known groundwater plume extending to river and mobilizing DDx Potential NAPL
Chloroethane	75-00-3	X		N	Not ecologically significant
Chloroform	67-66-3	X		N	Not ecologically significant
Chromium	7440-47-3	X	X	Y	Human health: surface water Known groundwater plumes at site.
Chrysene	218-01-9	X	X	Y	Human health: beach, sediment, water, fish/shellfish Evaluate as cPAH and PAH
Cobalt	7440-48-4	X		N	Not ecologically significant
Copper	7440-50-8	X		Y	Ecologically significant contaminant Known groundwater plumes at site
Cyanide	57-12-5	X		Y	Ecologically significant contaminant Known groundwater plumes at site
1,2-Dichlorobenzene	95-50-1	X		N	Not ecologically significant
1,4-Dichlorobenzene	106-46-7	X		N	Not ecologically significant
DDD (2,4´- and 4,4-DDD)	72-54-8	X	X	Y	Human health: fish/shellfish Ecologically significant contaminant Evaluate also as DDx
2,4'-DDD	53-19-0	X		Y	Evaluate as DDD and DDx
4,4'-DDD	72-54-8	X		Y	Evaluate as DDD and DDx
DDE (2,4- and 4,4-DDE)	72-55-9	X	X	Y	Human Health: fish/shellfish Ecologically significant contaminant Evaluate also as DDx
4,4'-DDE	72-55-9	X		Y	Evaluate as sum DDE and DDx
DDT (2,4´- and 4,4´-DDT)	50-29-3	X	X	Y	Human health: fish/shellfish Ecologically significant contaminant Evaluate also as DDx
4,4'-DDT	50-29-3	X		Y	Evaluate as DDT and DDx

Table 2.2-2
Summary of COC Selection Process
Portland Harbor Superfund Site
Portland, Oregon

Contaminant	CAS RN	BERA	BHHRA	Identified as a COC	Rationale for Including/Eliminating
Dibenz(a,h)anthracene	53-70-3	X	X	Y	Human health: beach, sediment, water, fish/shellfish Evaluate as cPAH and PAH
Dibenzofuran	132-64-9	X		N	Not ecologically significant
1,1-Dichloroethene (1,1-DCE)	75-35-4	X		Y	PCE/TCE plumes identified at site. DCE is a breakdown product of PCE/TCE.
cis-1,2-Dichloroethene (cis-1,2-DCE)	107-06-2	X		Y	PCE/TCE plumes identified at site. DCE is a breakdown product of PCE/TCE.
Dieldrin	60-57-1	X	X	Y	Human health: fish/shellfish Ecologically significant contaminant
Di-n-butyl phthalate	84-74-2	X		N	Not ecologically significant
2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7			Y	Known groundwater plume
Endosulfan	115-29-7	X		N	Not ecologically significant
Endrin	72-20-8	X		N	Not ecologically significant
Endrin ketone	53494-70-5	X		N	Not ecologically significant
Ethylbenzene	100-41-4	X		Y	Ecologically significant contaminant Known groundwater plumes at site
Fluoranthene	206-44-0	X		Y	Evaluate as PAH
Fluorene	7782-41-4	X		Y	Evaluate as PAH
Heptachlor epoxide	1024-57-3	X		N	Not ecologically significant
Hexachlorobenzene	118-74-1		X	Y	Human health: fish
beta-Hexachlorocyclohexane (β-BHC)	319-85-7	X		N	beta-Hexachlorocyclohexane only has an HQ=1.9 based on FPM, which does not reliably predict sediment toxicity for individual contaminants.
delta-Hexachlorocyclohexane (δ-BHC)	608-73-1	X		N	Not ecologically significant
gamma-Hexachlorocyclohexane (γ-BHC, or Lindane)	58-89-9	X		Y	Ecologically significant contaminant
1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-HxCDF)	70648-26-9			Y	Dioxin/Furan congener contributing most to 2,3,7,8-TCDD risk
Indeno(1,2,3-c,d)pyrene	193-39-5	X	X	Y	Human health: beach, sediment, water, fish/shellfish Evaluate as PAH
Iron	7439-89-6	X		N	Not a hazardous substance
Isopropylbenzene	98-82-8	X		N	Not a hazardous substance

Table 2.2-2
Summary of COC Selection Process
Portland Harbor Superfund Site
Portland, Oregon

Contaminant	CAS RN	BERA	BHHRA	Identified as a COC	Rationale for Including/Eliminating
Lead	7439-92-1	X	X	Y	Human health: Infrequent and/or anomalous detections in fish Ecologically significant contaminant. Eliminated for dietary pathway due to infrequent and/or anomalous detections in fish.
Magnesium	7439-95-4	X		N	Not ecologically significant
Manganese	7439-96-5	X		Y	Ecologically significant contaminant Known groundwater plumes at site
Methylchlorophenoxypropionic acid (MCPP)	7085-19-0		X	Y	Human health: surface water
Mercury	7439-97-6	X	X	Y	Human health: fish tissue Ecologically significant contaminant
2-Methylnaphthalene	91-57-6	X		Y	Evaluate as PAH
4-Methylphenol (p-Cresol)	106-44-5	X		N	Not ecologically significant
Monobutyltin		X		N	Not a hazardous substance
Naphthalene	118-96-7	X		Y	Evaluate as PAH
Nickel	7440-02-0	X		N	
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-PeCDD)	40321-76-4			Y	Dioxin/Furan congener contributing most to 2,3,7,8-TCDD risk
2,3,4,7,8-Pentachlorodibenzofuran (2,3,4,7,8-PeCDF)	57117-31-4			Y	Dioxin/Furan congener contributing most to 2,3,7,8-TCDD risk
Pentachlorophenol	87-86-5		X	Y	Human health: shellfish Known groundwater plumes
Perchlorate	14797-73-0	X		Y	Ecologically significant contaminant
Phenanthrene	85-01-8	X		Y	Evaluate as PAH
Phenol	108-95-2	X		N	Not ecologically significant
Polybrominated diphenyl ethers (PBDE)	67774-32-7		X	Y	Human health: fish
Polychlorinated Biphenyls (PCBs)	1336-36-3	X	X	Y	Human health: sediment, fish/shellfish Ecologically significant contaminant.
Polycyclic Aromatic Hydrocarbons (PAHs)	130498-29-2	X	X	Y	Human health: beach, sediment, water, fish/shellfish Ecologically significant contaminant
Potassium	7440-09-7	X		N	Not ecologically significant
Pyrene	129-00-0	X		Y	Evaluate as PAH
Silver	7440-22-4	X		N	Not ecologically significant

Table 2.2-2
Summary of COC Selection Process
Portland Harbor Superfund Site
Portland, Oregon

Contaminant	CAS RN	BERA	BHHRA	Identified as a COC	Rationale for Including/Eliminating
Sodium	7440-23-5	X		N	Not ecologically significant
Sulfide	18496-25-8	X		N	Not ecologically significant
2,3,7,8-Tetrachlorodibenzofuran (2,3,7,8-TCDF)	51207-31-9			Y	Dioxin/Furan congener contributing most to 2,3,7,8-TCDD risk
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	1746-01-6	X	X	Y	Human health: sediment, fish/shellfish Ecologically significant contaminant
Tetrachloroethene (PCE)	127-18-4			Y	PCE plumes identified at site
Toluene	108-88-3	X		Y	Known groundwater plume at site
Total Petroleum Hydrocarbons (TPH) C10-C12 Aliphatic		X		Y	Not a hazardous substance; co-mingled with other hazardous substances Ecologically significant contaminant Known TPH plumes at site
Total Petroleum Hydrocarbons (TPH) C4 - C6 Aliphatic		X		N	Not a hazardous substance; co-mingled with other hazardous substances
Total Petroleum Hydrocarbons (TPH) C6 - C8 Aliphatic		X		N	Not a hazardous substance; co-mingled with other hazardous substances
Total Petroleum Hydrocarbons (TPH) C8 - C10 Aromatic		X		N	Not a hazardous substance; co-mingled with other hazardous substances
Total Petroleum Hydrocarbons (TPH), diesel range		X		N	Not a hazardous substance; co-mingled with other hazardous substances
Total Petroleum Hydrocarbons (TPH), gasoline-range		X		N	Not a hazardous substance; co-mingled with other hazardous substances
Total Petroleum Hydrocarbons (TPH), residual-range		X		N	Not a hazardous substance; co-mingled with other hazardous substances
Tributyltin (TBT)	688-73-3	X		Y	Ecologically significant contaminant
Trichloroethene (TCE)	79-01-6	X		Y	Known groundwater plume extending to river. Potential for others.
1,2,4-Trimethylbenzene	95-63-6	X		N	Not ecologically significant
1,3,5-Trimethylbenzene	108-67-8	X		N	Not ecologically significant
2-(2,4,5-Trichlorophenoxy)propionic acid (2,4,5-TP)	93-72-1			Y	Known groundwater plume
Vanadium	7440-62-2	X		Y	Ecologically significant contaminant
Vinyl Chloride	75-01-04			Y	PCE/TCE plumes identified at site. Vinyl chloride is a breakdown product of PCE/TCE.

Table 2.2-2
Summary of COC Selection Process
Portland Harbor Superfund Site
Portland, Oregon

Contaminant	CAS RN	BERA	BHHRA	Identified as a COC	Rationale for Including/Eliminating
m-Xylene	108-38-3	X		N	Not ecologically significant
o-Xylene	95-47-6	X		N	Not ecologically significant
p-Xylene	106-42-3	X		N	Not ecologically significant
Xylenes	1330-20-7	X		Y	Known groundwater plume at site
Zinc	7440-66-6	X		Y	Ecologically significant contaminant Known groundwater plumes at site

Table 2.2-3a
Basis for Portland Harbor COC Selection by RAO and Media
Portland Harbor Superfund Site
Portland, Oregon

	HUMAN HEALTH					
	RAO 1		RAO 2		RAO 3	RAO 4
	Human Health Ingestion/Direct Contact		Human Health Fish/Shellfish Consumption		Human Health Protected Water Uses	Human Health Migration of Contaminated Groundwater
Contaminant	**Beach**	**Sediment**	**Tissue**	**Sediment**	**Surface Water**	**Groundwater**
Aldrin			R	R	R	
Arsenic	R	R	R	R	R	A
Benzene						A
BEHP			R	R	R	
Cadmium						
Chlordane			R	R	R	
Chlorobenzene						A
Chromium					R	A
Copper						A
Cyanide						A
DDx			R	R		
DDD (2,4- and 4,4-DDD)					R	R
4,4'-DDD					R	A
DDE (2,4- and 4,4-DDE)						A
4,4'-DDE					R	A
DDT (2,4- and 4,4-DDT)					R	R
4,4'-DDT					R	A
1,1-DCE						A
cis-1,2-DCE						A
Dieldrin			R	R		
2,4-D acid						A
Ethylbenzene						A
Hexachlorobenzene			R	R	R	
Lindane						
Lead						
Manganese						R
MCPP					R	
Mercury			R	R		
Pentachlorophenol			R	R	R	A
Perchlorate						A
PBDE			R	R		
PCBs		R	R	R	R	

Table 2.2-3b
Basis for Portland Harbor COC Selection by RAO and Media
Portland Harbor Superfund Site
Portland, Oregon

	HUMAN HEALTH					
	RAO 1		RAO 2		RAO 3	RAO 4
	Human Health Ingestion/Direct Contact		Human Health Fish/Shellfish Consumption		Human Health Protected Water Uses	Human Health Migration of Contaminated Groundwater
Contaminant	**Beach**	**Sediment**	**Tissue**	**Sediment**	**Surface Water**	**Groundwater**
PAHs	R	R	R	R	R	A
Acenaphthene						
Acenaphthylene						
Anthracene						
Benzo(a)anthracene						
Benzo(a)pyrene						
Benzo(b)fluoranthene						
Benzo(g,h,i)perylene						
Benzo(k)fluoranthene						
Chrysene						
Dibenz(a,h)anthracene						
Fluoranthene						
Fluorene						
Indeno(1,2,3-c,d)pyrene						
2-Methylnaphthalene						
Naphthalene						
Phenanthrene						
Pyrene						
2,3,7,8-TCDD Eq		R			R	
1,2,3,4,7,8-HxCDF			R	R		
1,2,3,7,8-PeCDD			R	R		
2,3,4,7,8-PeCDF			R	R		
2,3,7,8-TCDD			R	R		
2,3,7,8-TCDF			R	R		
PCE						A
Toluene						A
TPH diesel (C10-C12 Aliphatic)						
TBT						
TCE						A
2,4,5-TP acid						A
Vanadium						
Vinyl Chloride						A
Xylenes						A
Zinc						

Notes:
R - Conclusion from Baseline Risk Assessment
A - ARAR

PORTLAND HARBOR RI/FS

APPENDIX I

SURFACE WEIGHTED AVERAGE CONCENTRATION UNCERTAINTY ANALYSIS (PCBS, TOTAL PAHS, DDX)

FEASIBILITY STUDY

June 2016

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Figure I-8 Surface Weighted Average Concentration for DDx vs. RAL

I1. INTRODUCTION

An evaluation of the uncertainties in predicted post-construction surface sediment COC concentrations was conducted, consistent with the recommendation provided the joint National Remedy Review Board/Contaminated Sediments Technical Advisory Group Comments on the proposed remedy (EPA 2015).

Because predictions of post-construction SWACs are based on a sample from the population of contaminated sediments, statistical uncertainties are unavoidable. In addition, because most remedial investigation data are based on a mixture of sampling designs, some of which are spatially biased accurate estimates of spatial averages must generally be based on weighted averages which are intended to counter the effects of spatially biased sampling designs. In geostatistics this is referred to as de-clustering the data (Isaaks and Srivastava, 2005).

The Portland Harbor FS, data were declustered by first interpolating the concentrations to a 10-foot by 10-foot regularly spaced grid, followed by averaging the values on these grid nodes. This approach based on natural neighbor interpolation has been found to preform reasonably well for reducing bias in SWAC estimates when they are based on a combination of biased and unbiased sampling designs (Kern et al. 2009). The natural neighbor interpolation was also used as a basis to forecast performance of a range of remedial alternatives based on actions taken in areas with the highest interpolated concentrations—referred to as hill-topping. This report documents an evaluation of the uncertainty in these predictions of remedial effectiveness using nonparametric geostatistical procedure known as conditional simulation using the P-field method (Srivastava, 2005).

I2. METHODS

I2.1 DECLUSTERING METHOD SENSITIVITY

Prior to conducting the conditional simulation analysis, four declustering techniques were tested to gain an understanding of the sensitivity of SWAC estimates to declustering methods. Methods that were tested included; 1) Thiessen polygons, 2) polygonal declustering, 3) stratified sampling based methods and 4) natural neighbor interpolation.

I2.2 FUTURE CONDITION

Uncertainty in predicted future condition was evaluated using two approaches; 1) considering basic mathematical constraints relating percentage area remediated, percentage reduction in SWAC and the ratio of remediated to unremediated areas, and 2) using a spatial Monte-Carlo approach to directly estimate confidence limits on post remedial SWAC under a range of remedial action limits (RALs). The first approach is a diagnostic providing a relative understanding of the demands that may be placed on the resolution of the delineation of deposits relative to experiences at other Superfund Mega Sites. The second approach provides a more direct evaluation of the expected remedial performance, under the combination of existing circumstances, including deposit complexity and level of sampling resolution.

I2.2.1 Mathematical Constraints on Remedial Alternatives

Future condition under selected alternative scenarios was evaluated by considering basic mathematical constraints on the relationships between proportion reduction in post remedial SWAC, the percentage of area remediated, and the ratio of concentrations in remediated to unremediated areas. The constraints are based on equations in **Figure I-1** and provide remedial managers with a relative understanding of the potential level of resolution necessary to achieve remedial targets. In particular, when the remedial footprint is small and the targeted reduction in concentration is large, the ratio of average concentration in remediated areas must be much greater than that in un-remediated areas. This will be feasible, only when high concentration deposits are well-consolidated and easily delineated, or with high density sampling providing highly resolved delineation of otherwise unconsolidated complex depositional patterns.

I2.2.2 Conditional Simulation

Conditional simulation is a computer intensive resampling method analogous to bootstrap resampling, with the added constraint that rather than randomly selecting individual sample values, whole concentration maps are randomly selected and analyzed (**Figure I-2**). These maps can be thought of as a deck of cards, each of which interpolates the sample data and is also consistent with the spatial variation observed in

the sample. The analysis proceeds by randomly selecting one of many equally likely maps to which proposed remedial strategies are applied. The results for each randomly selected map are summarized, providing a means to propagate spatial variation and uncertainty through complex calculations, linking uncertainty in maps with uncertainty in SWAC predictions.

The technique takes into account the spatial uncertainty in mapped surfaces, and is spatially scalable and also accounts for uncertainty in the delineation boundaries. Uncertainty calculations help to quantify the effects of the situation where some contaminant concentrations within the RAL footprint are less than the RAL, as well as the when some concentrations outside the footprint may be greater than the RAL. These types of errors are assumed negligible when forecasts are based purely on a single smooth surface which can lead to inaccurate evaluations, usually biased toward overstatement of remedial benefit. This analysis provides an assessment of how these uncertainties accumulate in the post remedial SWAC predictions.

Detailed P-Field Simulation Procedure (Optional Reading)

The P-field simulation method involves three primary steps; 1) defining conditional cumulative distributions for COCs at each 10 by 10 foot grid cell, 2) simulating a spatially correlated normally distributed random variable for each grid cell, and 3) transforming the normally distributed variable to the original COC scale by identifying the percentile of the COC distribution with corresponding percentile of the simulated normal random variable at each grid cell. The cumulative distributions represent narrower ranges near sample values and wider ranges far from sample values, causing the simulated surfaces to match measured values at the sampled locations, whereas they may vary relatively widely in areas that are distant from sampled locations.

The conditional cumulative distribution functions were estimated using a nonparametric approach based on natural neighbor interpolation approximating the indicator kriging method that is typically used to estimate cumulative distribution functions. Estimating conditional distributions requires interpolation of a range of binary (0 or 1) indicators defined based on COC concentrations being above or below a range of threshold values of interest. In this analysis threshold values were chosen to represent percentiles of the COC distributions, (1, 2.5, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 95, 97.5 and 99). For each percentile, the sample data were coded as 1 for values below threshold and 0 for values above threshold, and these binary values were interpolated using natural neighbor interpolation. This process was repeated for each of the 15 threshold values, resulting in 15 interpolated surfaces representing the probability that COC concentrations were less than the threshold value. This series of 15 probability values unique to each grid cell is an estimate of the conditional cumulative distribution at that location. Traditionally this interpolation is conducted using indicator kriging. However, using natural neighbor interpolation has two distinct advantages, there is no need to

model 15 sets of directional indicator variograms necessary for kriging,, and the natural neighbor method does not require any assumptions of stationarity as is assumed for kriging. Effectively by using the natural neighbor method to interpolate the indicator data, the resulting simulation is both non-parametric as well as accommodating spatially nonstationary COC distributions.

I3. RESULTS

I3.1 DECLUSTERING METHOD SENSITIVITY

Estimated SWACs for PCBs based on four declustering methods ranged from 79 µg/kg for the method stratified on RAL areas, to 205 µg/kg based on unweighted averages within geographic strata. The geographic areas used in this analysis are presented on **Figure I-9**. The stratified method based on Thiessen Polygon weighting was 135 µg/kg, and the method stratified based on RAL areas and using Thiessen Polygon weighting was similar to the natural neighbor method deployed in the FS. As shown, the effects of biased sampling are substantial, with higher unweighted estimates reflecting tendency to focus sampling on high concentration areas. This indicates that some form of declustering is appropriate to improve the accuracy of estimates which would otherwise be based on an unweighted average.

I3.2 MATHEMATICAL CONSTRAINTS

The planned percentage SWAC reduction was plotted against percentage area remediated for PCBs to evaluate the susceptibility of remedial alternatives identified in the FS to delineation errors, and to compare with other remedial alternatives implemented at a number other Superfund Sites (**Figure I-3**). Alternatives E and G each require that the ratio of average SWAC within remediated to unremediated areas should be approximately a 10 to 1 ratio—both alternatives falling roughly along the red 10 to 1 curve. Other sites that have deployed similar ratios, include the Fox River OU4-5 and River Section 2 of the Hudson River. The results at the Fox River Site are not yet complete; however, the deposits there were relatively broadly distributed and only mildly consolidated and ultimately substantial design sampling has been required to achieve this goal. Conversely, deposits in River Section 2 of the Hudson River Site are better consolidated, but not as well consolidated as is apparent in Portland Harbor, and the desired outcome was not fully achieved there. Based on qualitative observation of the distribution of surface COCs at Portland Harbor, it is anticipated that this 10 to 1 ratio is likely to be achievable with substantially less resolution than was required at the Fox River Site, and potentially similar sampling densities to those deployed at the Hudson River in River Section 2. The conditional simulation will help to test this observation more rigorously.

I3.3 CONDITIONAL SIMULATION

Conditional simulation was used to estimate uncertainty in the SWAC vs RAL relationship. The RAL was varied for each COC representing remedial action limits associated with alternatives B through G described in the FS (**Table I-2**). The lateral footprint for each RAL was defined by all grid cells with natural neighbor interpolated concentrations exceeding each specified RAL.

To simulate remediation, remediated cells were replaced with expected background concentrations and SWAC was calculated by averaging all cells (remediated and un-remediated) in the map

Four equally likely simulated maps of PCB concentration are shown in **Figure I-4** to illustrate the level of variation that may occur between maps, but that is nonetheless consistent with the sample data. The RAL boundaries for Alternative E, established from the smooth natural neighbor interpolation, are overlaid so that it can be seen that for some maps, areas outside the remedial footprint exceed the 200 µg/kg threshold and that in some areas for some maps concentrations inside the remedial footprint may be less than the RAL. Generally areas within the RAL footprints tend to be similar among all four maps; however, some areas outside the footprint tend to vary substantially, as indicated by the callouts in the left two panels. This reflects the greater sampling density within the deposits relative to somewhat lower sampling density within the navigation channel, where concentrations are lower and inaccuracies in delineation have less effect on remedial effectiveness.

Conditionally simulated SWACs for PCB concentrations varied from approximately 67 to 95 with an average of 79 prior to remediation, which was equal to the SWAC estimated from the average of the natural neighbor surface (**Figure I-5**). These values were equal because the simulation algorithm is intentionally constrained so that the synthetic mean is required to match the declustered SWAC based directly on sample data.

This range is also portrayed on **Figure I-6**, depicted as a gray band surrounding the pre-remedial SWAC estimate. The simulated SWAC distribution, depicted as red squares with error bars shows that as expected SWAC declines with lower RALs. Additionally, the uncertainty bounds on SWAC is narrower for lower RAL values reflecting that a larger remedial footprint both reduces the SWAC but also its uncertainty. Action limits of 750 µg/kg and 1,000 µg/kg had higher uncertainties, with remedial benefit potentially within the margin of error, as indicated by the overlapping uncertainty bounds with the pre-remedial SWAC. Post remedial SWAC for total PCB is clearly outside the margin of error of pre-remedial SWAC indicating clear expectations that the predicted remedial benefit is likely to be achieved in practice.

Pre and post remedial total PAH and DDx concentrations in relation to action limits are plotted on **Figure I-7** and **Figure I-8** respectively. These distributions are characterized by similar qualitative patterns to those observed for PCBs. Relative error is generally greater for these COCs than for PCBs which had greater skewedness in the PAH and DDx distributions, relative to the PCB distribution. Notably, the effects of this uncertainty are minimized in the post remedial forecasts where these areas are remediated under any RAL considered, and therefore their influence is eliminated from the analysis. These RAL and corresponding SWAC values are also summarized in **Table I-3**.

I4. DISCUSSION

Surface weighted average concentration is an estimate exposure to receptors which may range over large areas. If sampling were purely unbiased, standard estimation methods for the mean and its confidence interval would be appropriate and less computationally complex. Because the sample data are right skewed, nonparametric, as opposed to normal theory, methods are preferred irrespective of the sampling design. If the sampling design had been unbiased, one could select one of the bootstrap based methods provided in ProUCL for estimating the mean and it is UCL. However, with biased sampling prevalent at Portland Harbor it is necessary to spatially weight the data in order reduce bias in the estimated mean and to properly characterize uncertainty bounds. Conditional simulation, is a variant of bootstrapping for designed to accommodate biased sampling designs and data that are spatially correlated.

The gray band on **Figures I-6** through **I-8** represents the 95 percent confidence interval for the pre-remedial SWAC, and the error bars represent 95 percent prediction intervals for the post remedial SWAC corresponding to each RAL. When these intervals do not overlap, one can be more than 95 percent confident that the pre and post remedial means would differ ($p<0.05$). When one error bar overlaps the mean there is no difference at the 5 percent level of confidence ($p>0.05$) and when error bars overlap slightly, one can conclude that there are differences but that the confidence level may be somewhat less than 95 percent. Generally, any RAL which results in an estimated SWAC with error bars that do not overlap the confidence limits of the pre-remedial SWAC can be expected to reliably result in reduced post-remedial concentrations within the range of values bounded by the confidence limits.

It should also be noted that as the RAL declines, the error bars also decline. This is because the variance the change in SWAC is proportional to the square of the proportion of area remediated.

$$var(\Delta SWAC(=)Proportion\ \ Remediated^{2}\times)var(\Delta Concentration)$$

Simply, as the size of the remedial footprint grows, the chance of making delineation mistakes declines with the area remediated. If the entire site is remediated, there is no uncertainty.

I5. REFERENCES

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Tables

Table I-1
Declustering Method Sensitivity for PCBs
Portland Harbor Superfund Site
Portland, Oregon

Declustering Method	SWAC Estimates PCBs (µg/kg)
Stratified and Unweighted	205
Stratified on Geographic areas with Thiessen Polygons	135
Stratified on RAL Areas with Thiessen Polygons	79
Polygonal Declustering	105
Average Natural Neighbor Map	80

Table I-2
RALs for Remedial Options B through G for PCBs, Total PAH and DDx
Portland Harbor Superfund Site
Portland, Oregon

COC Name	Units	Remedial Option					
		B	C	D	E	F	G
PCBs	µg/kg	1,000	750	500	200	75	50
Total PAHs	µg/kg	170,000	130,000	69,000	35,000	13,000	5,400
DDx	µg/kg	650	550	450	300	160	40

Table I-3
Predicted Post Remedial SWAC (µg/kg) for a RALs.
Portland Harbor Superfund Site
Portland, Oregon

COC	RAL	95% Lower Confidence Limit	SWAC	95% Upper Confidence Limit
PCBs	50	22	24	25
	75	27	28	30
	100	30	32	34
	200	37	42	46
	500	48	55	64
	750	53	61	72
	1,000	56	65	77
Total PAHs	5,400	2,082	2,580	3,116
	13,000	2,899	3,882	4,845
	35,000	3,979	5,618	7,251
	69,000	4,518	6,817	9,405
	130,000	5,479	8,641	13,035
	170,000	6,054	9,539	14,980
DDx	40	13	16	19
	160	19	24	33
	300	21	28	43
	450	23	33	55
	550	23	35	64
	650	24	38	71

Figures

A_U –Unremediated Area

C_U--Unremediated Concentration

A_R –Remediated Area

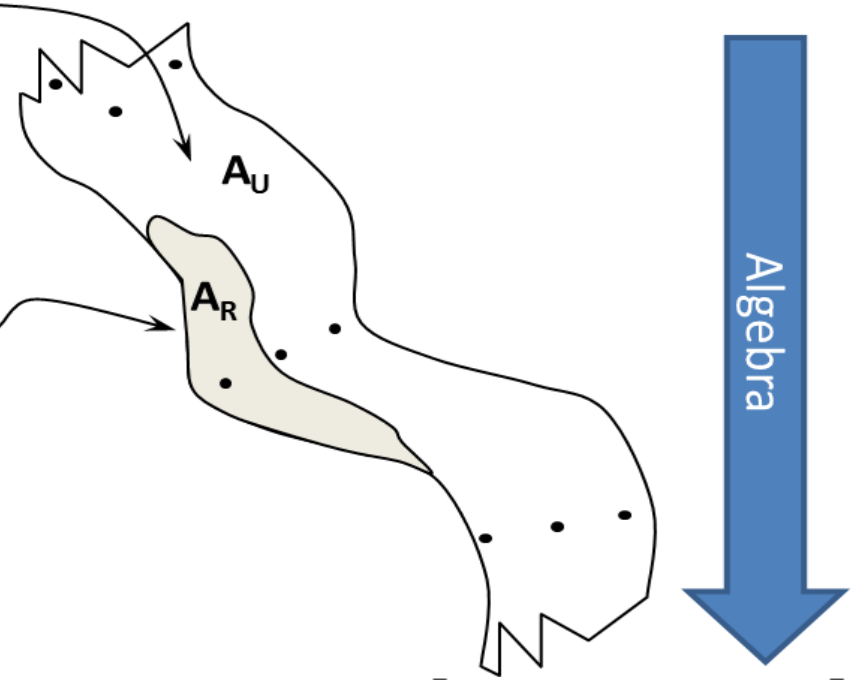
C_R-Remedial Footprint Concentration

$C_{Residual}$ -Post-remedial Concentration

$$R_A = A_R/(A_R + A_U)$$

$$R_C = C_R/C_U$$

$$SWAC = \frac{(A_U \times C_U + A_R \times C_R)}{A_U + A_R}$$



$$\frac{\Delta SWAC}{SWAC} = R_A \left[\frac{1 - \frac{C_{Residual}}{C_R}}{R_A + (1 - R_A)/R_C} \right]$$

Figure I-1. Mathematical Relationships Governing Remedial Performance

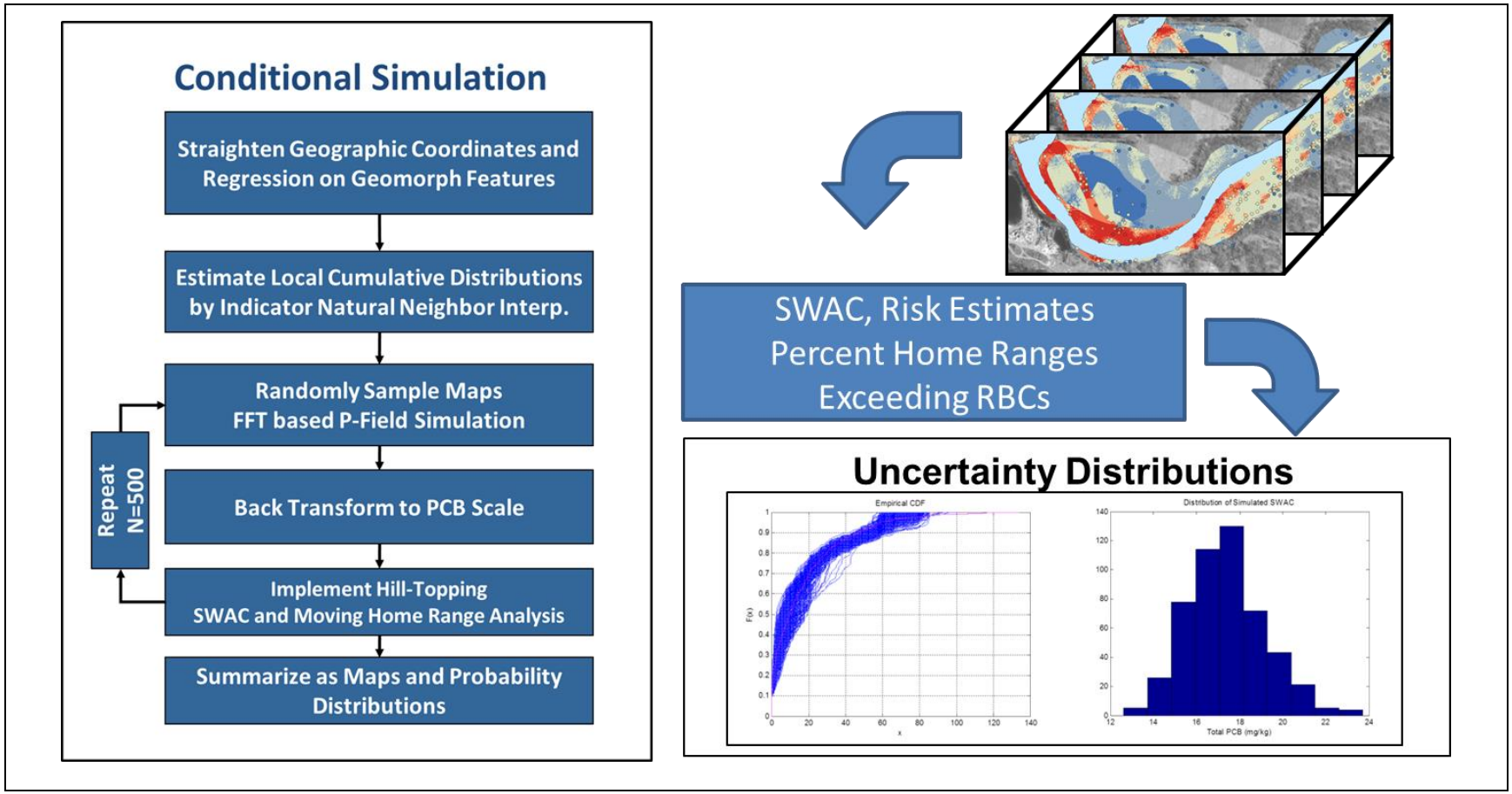


Figure I-2. Conditional Simulation Procedure

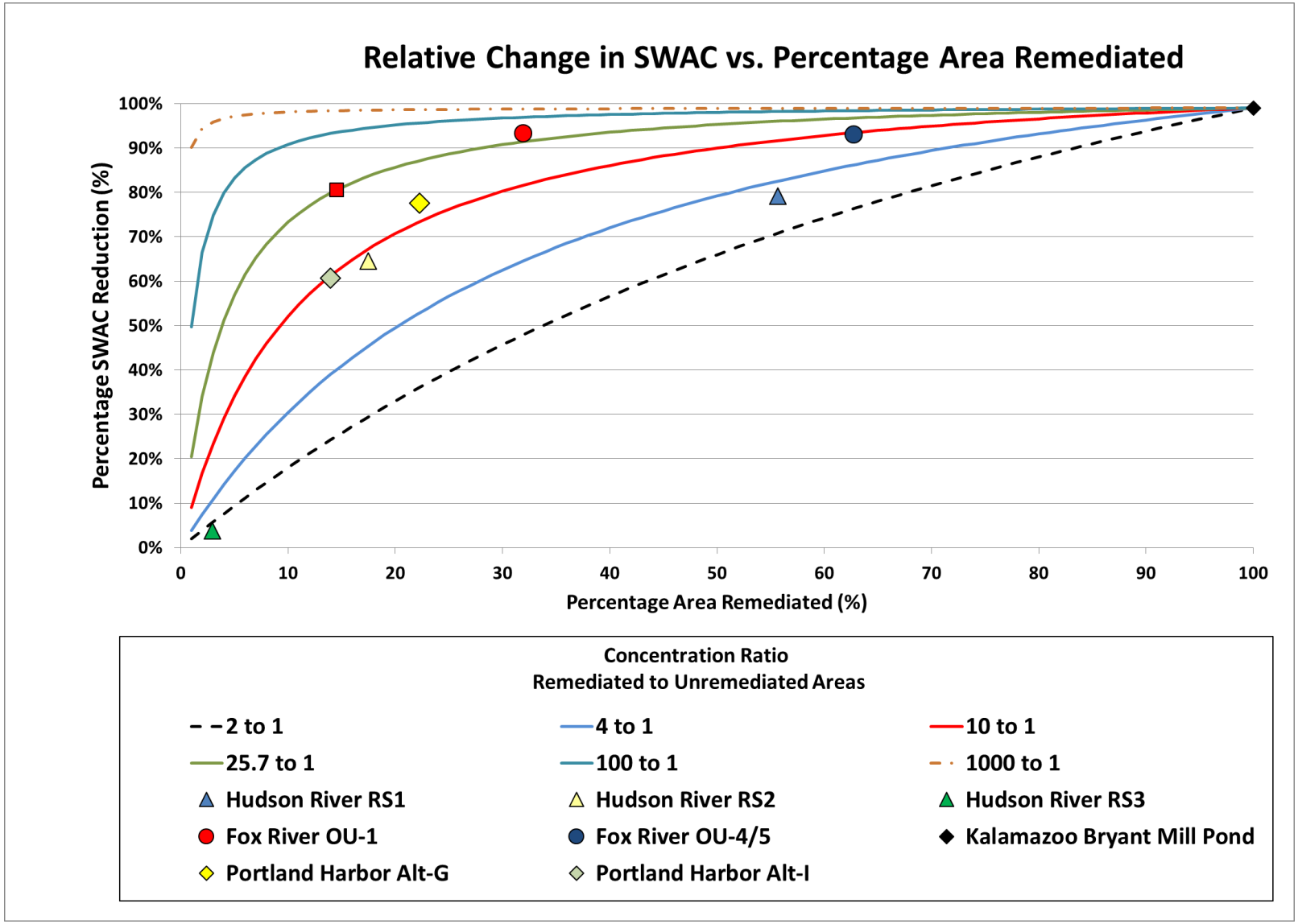


Figure I-3. Relative Change in SWAC vs Percentage Area Remediated

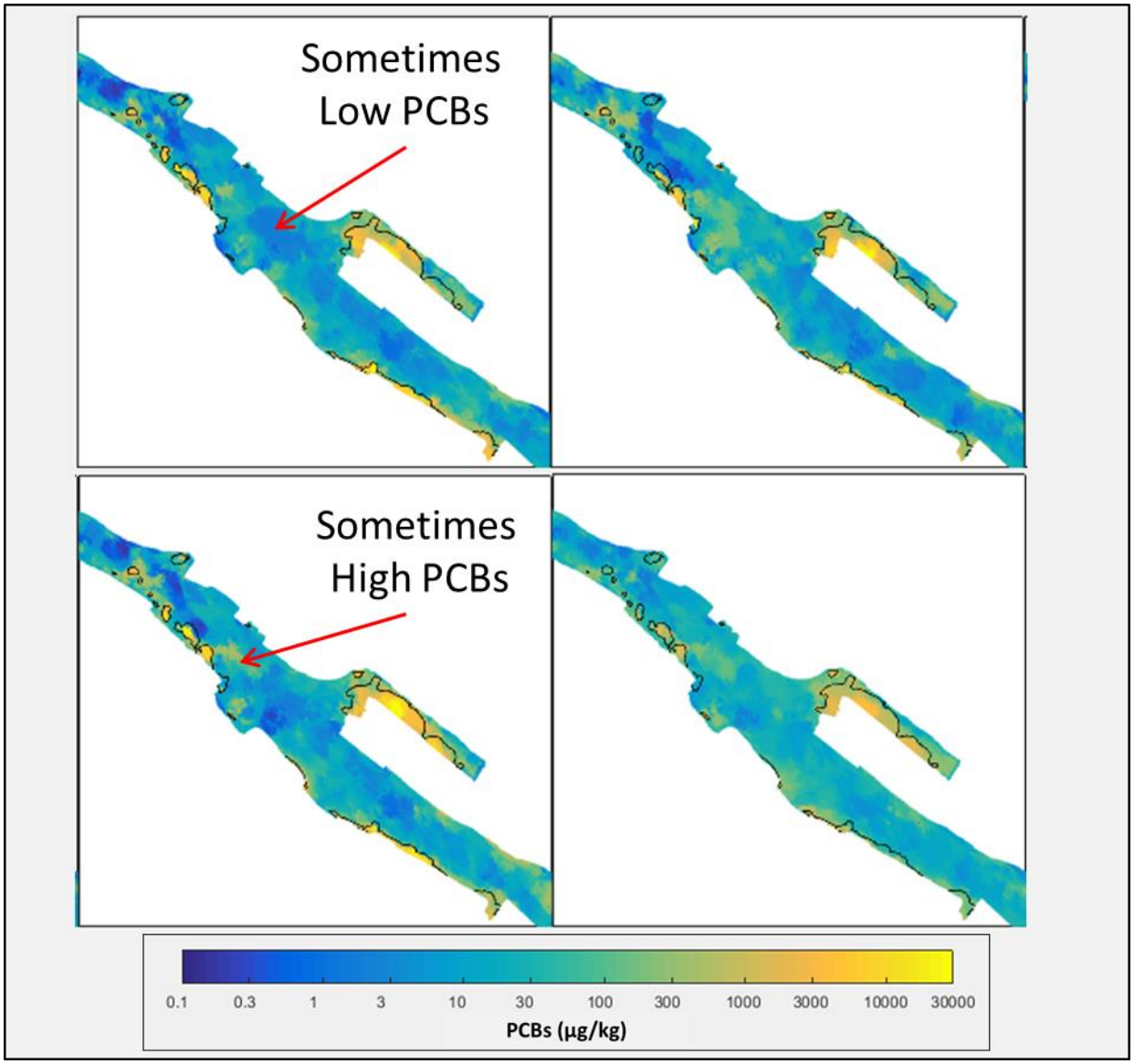


Figure I-4. Four Equally Likely Simulated Maps of PCBs

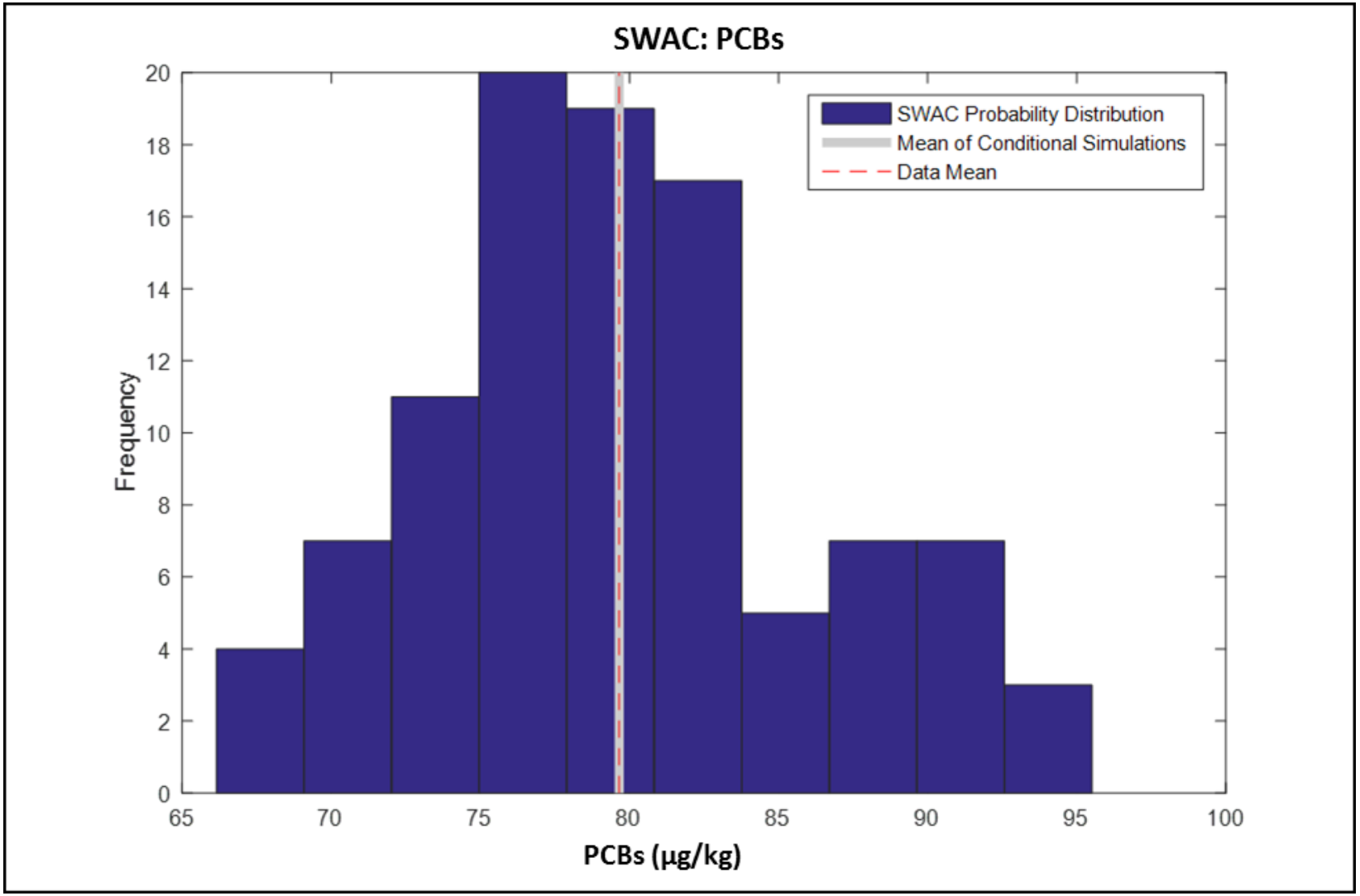


Figure I-5. Pre-Remedial SWAC - PCBs

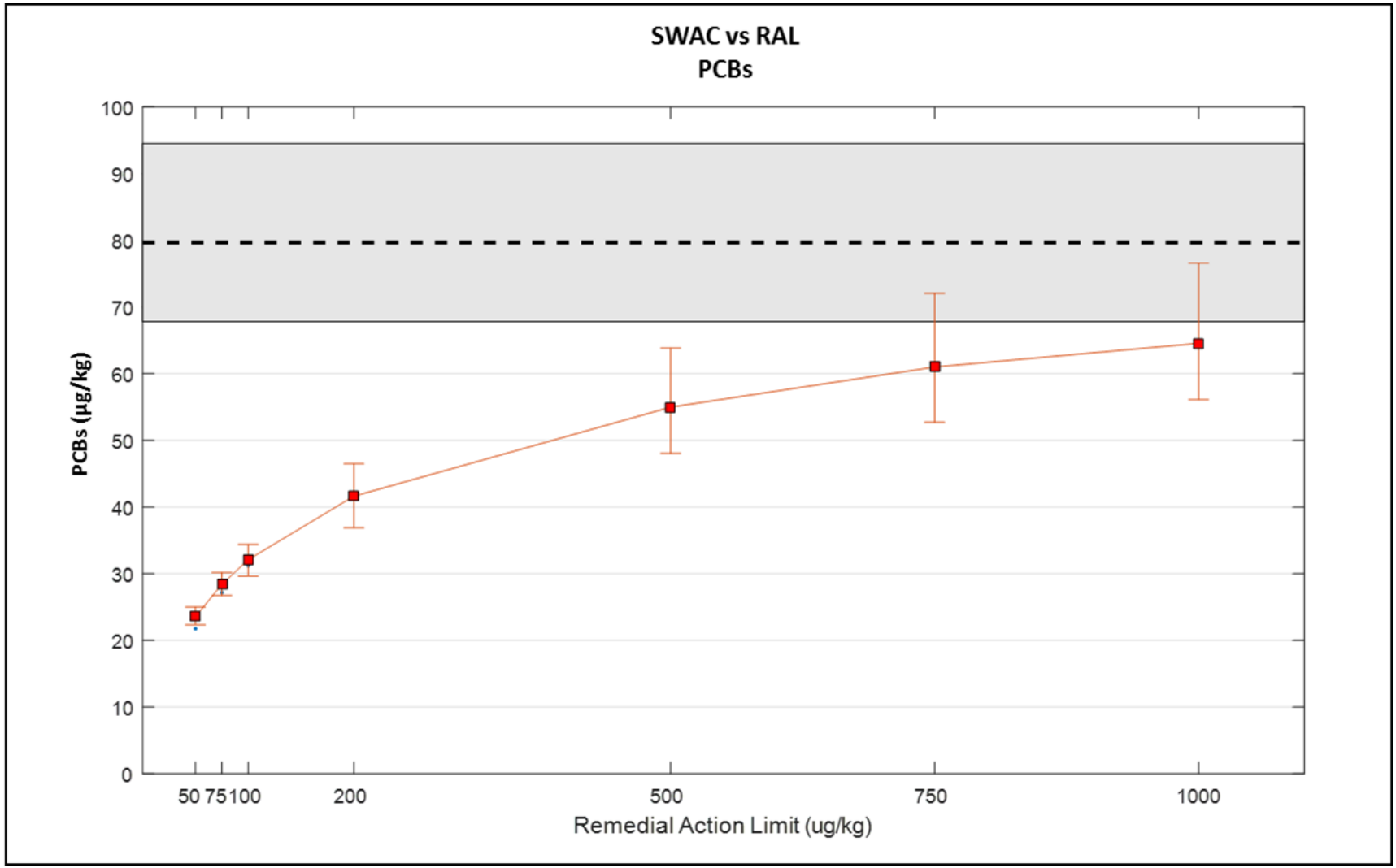


Figure I-6. Surface Weighted Average Concentration for PCBs vs. RALs

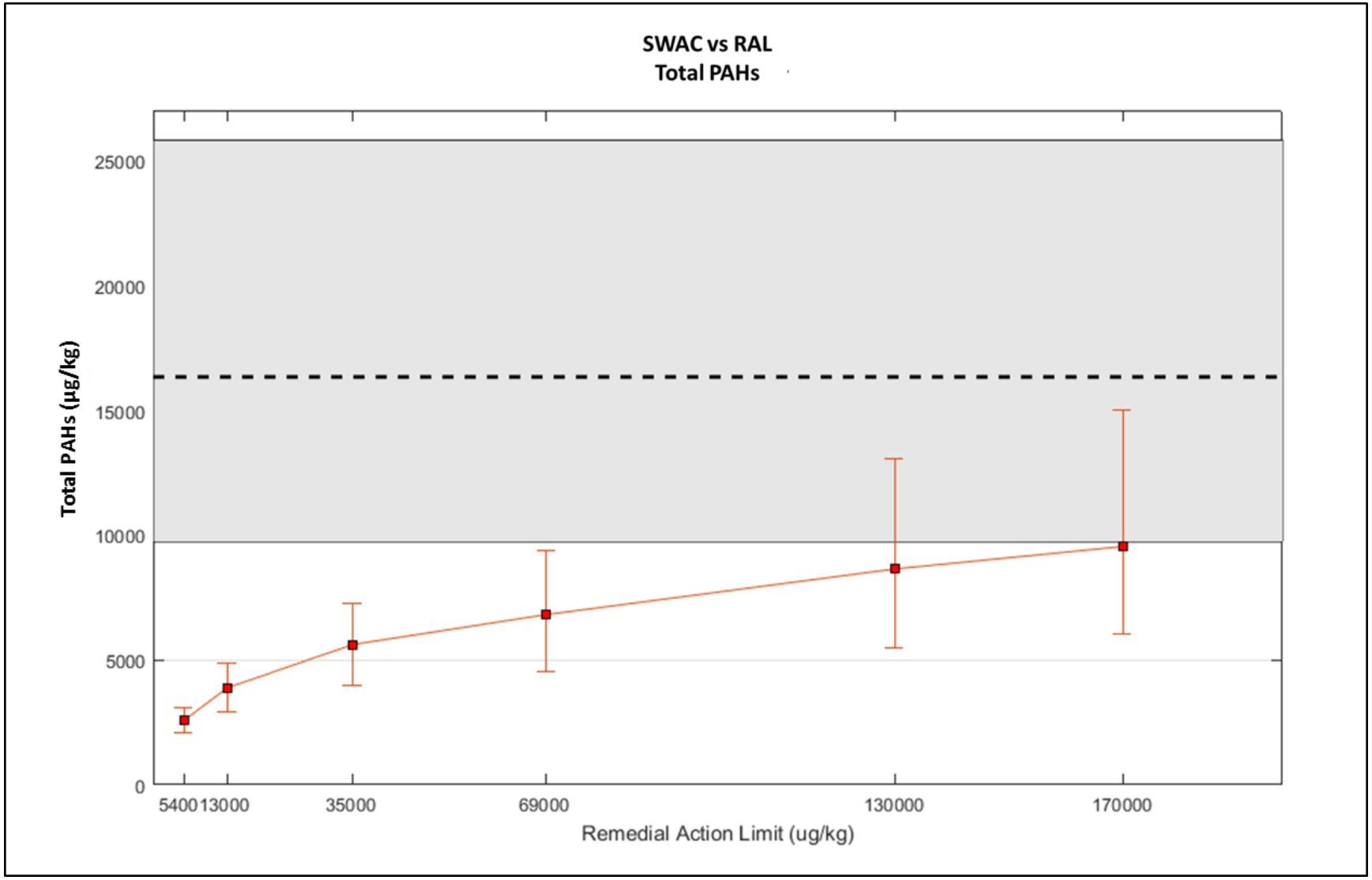


Figure I-7. Surface weighted average concentration for Total PAHs vs. RALs

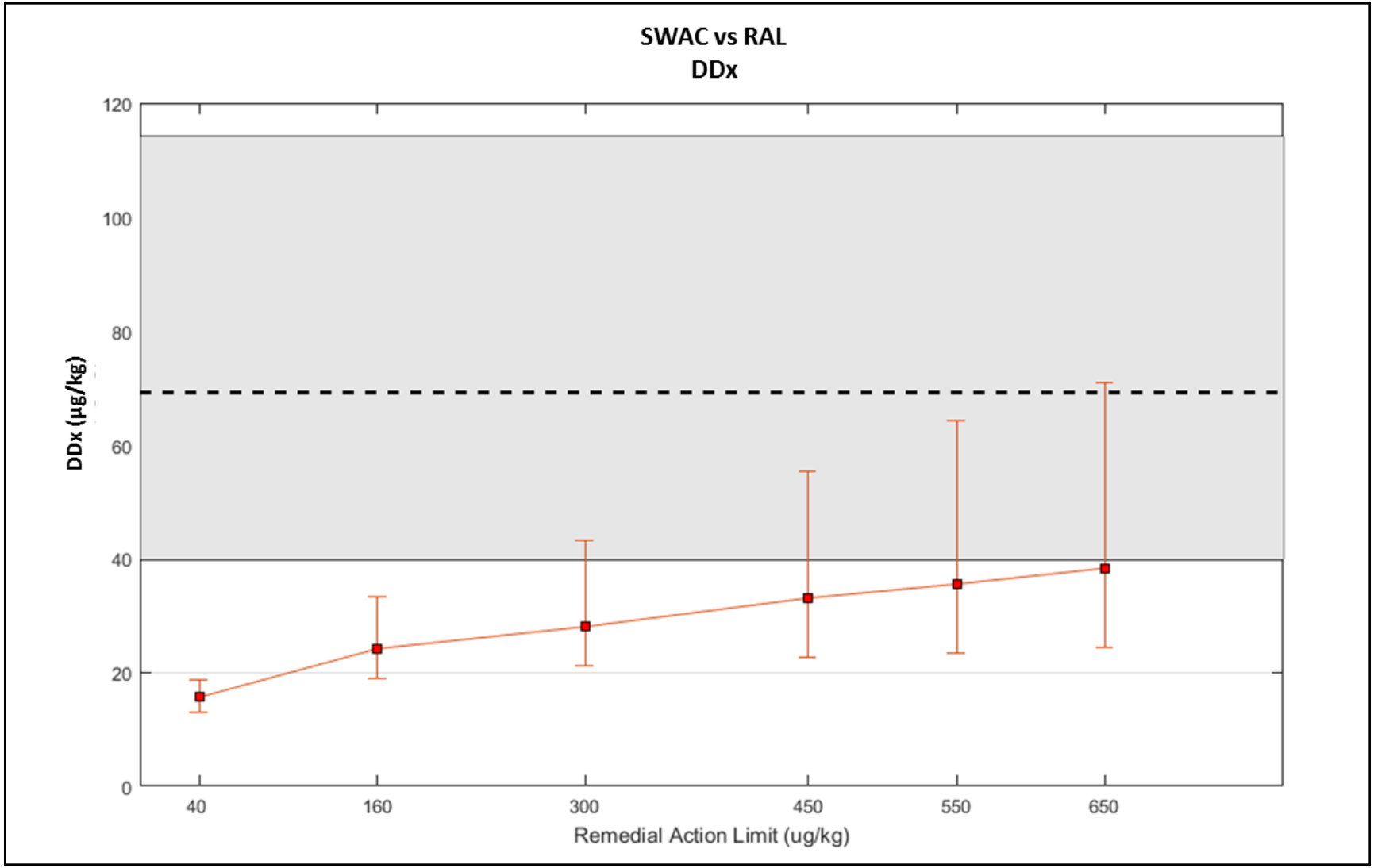


Figure I-8. Surface Weighted Average Concentration for DDx vs. RALs

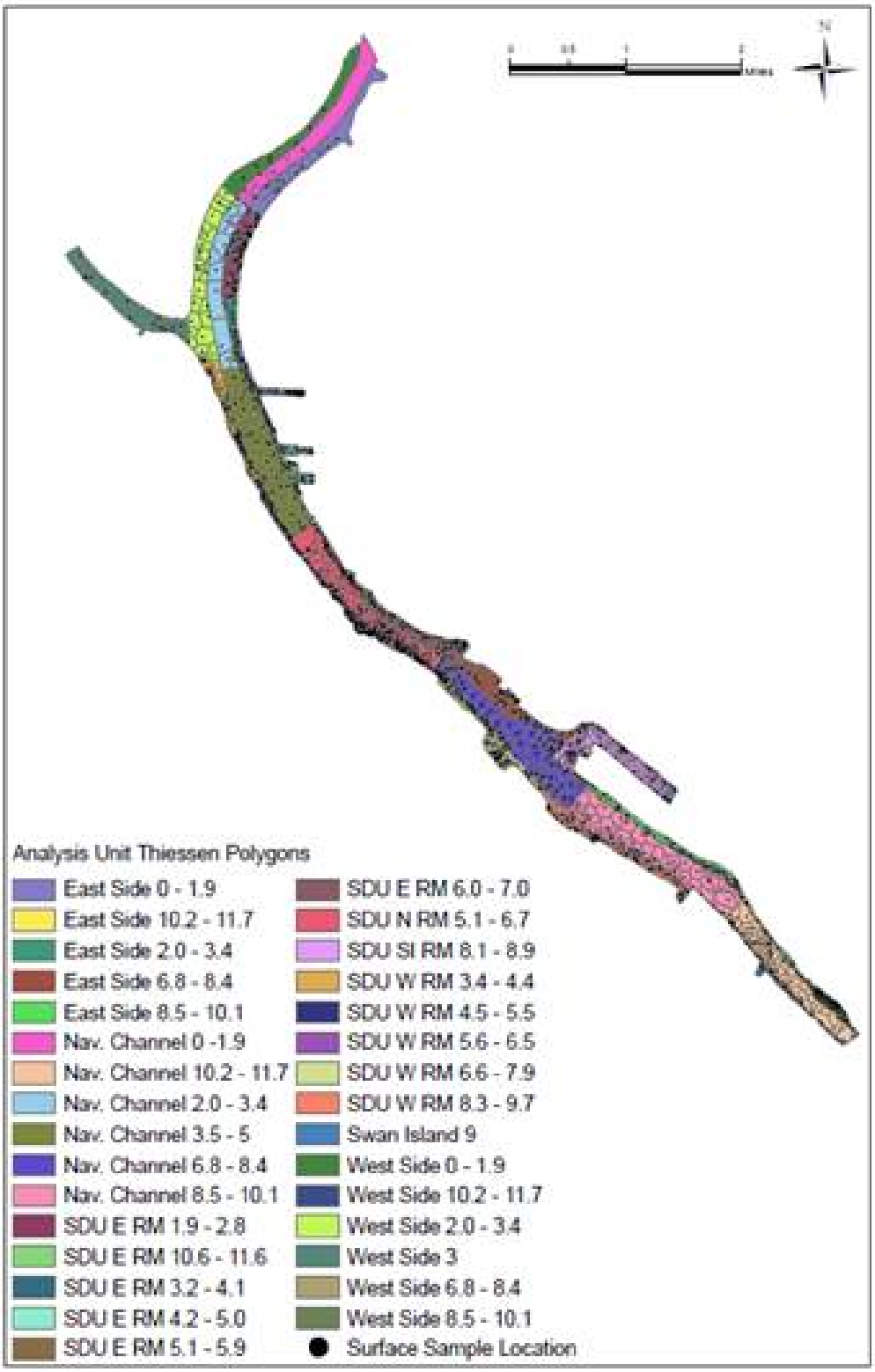


Figure I-9. SDUs and geographic areas used to develop Site-wide SWAC.