2019 Record of Decision Amendment

Part 1—Declaration
Part 2—Decision Summary

Wyckoff/Eagle Harbor Superfund Site
Bainbridge Island, Washington

U.S. Environmental Protection Agency, Region 10

May 2019

Contents

Tables

Figures

PART 1

Declaration

1.1 Site Name and Location

Site Name: Wyckoff/Eagle Harbor Superfund Site
Location: Bainbridge Island, Kitsap County, Washington
Latitude: 47.61535 North, Longitude -122.49986 West
U.S. Environmental Protection Agency Identification Number: WAD 009248295

1.2 Statement of Basis and Purpose

This decision summary presents the decision by the U.S. Environmental Protection Agency (EPA) to implement additional cleanup actions at the Wyckoff/Eagle Harbor Superfund Site (the Site) in Bainbridge Island, Kitsap County, Washington. This decision amends the 2000 Record of Decision (ROD) for Soil and Groundwater, Operable Units 2 and 4 (OU2 and OU4) at the former Wyckoff wood-treating facility (EPA, 2000a). The selected remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), United States Code Title 42, Section 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Code of Federal Regulations (CFR) Title 40, Part 300, as amended. This decision is based on the Site's Administrative Record.

The State of Washington, acting through the Washington State Department of Ecology (Ecology), concurs with the selected remedy.

1.3 Site Assessment

The Selected Remedy in this Interim Record of Decision Amendment (RODA) is necessary to protect the public health, welfare, and/or environment from actual or threatened releases of hazardous substances into the environment or from actual or threatened releases of pollutants or contaminants from the Site that may present an imminent and substantial endangerment to public health or welfare.

1.4 Description of the Selected Remedy

The Selected Remedy revises the existing cleanup decision in soil and groundwater at the former Wyckoff wood-treating facility. The previous (2000) cleanup decision called for steam-enhanced extraction, with containment as the contingent remedy if steam-enhanced extraction did not meet cleanup goals. This RODA revises the 2000 cleanup decision with a new remedy to treat nonaqueous-phase liquid (NAPL) present in surface and subsurface soil and groundwater within a portion of OU2/OU4. The Selected Remedy will treat or remove source materials constituting principal threats at the Site. The following comprises the Selected Remedy for soil and groundwater:

- Demolishing and removing, and decontaminating and reusing remaining concrete building foundations and debris, including the steam extraction pilot test equipment that remains on Site from the previous remedial action
- Installing an underground "cutoff" wall along the south side of the former wood-treating area to divert upgradient groundwater around contaminated soil and groundwater
- Treating of an estimated 267,000 cubic yards of NAPL-contaminated soil and groundwater through in situ soil solidification/stabilization (ISS), to be accomplished by blending a cement based reagent

with NAPL-contaminated soil and groundwater in situ through a combination of jet grouting in the deepest treatment areas, auger mixing in the center of the Site where contamination is thickest, and excavator mixing in shallow treatment areas

- Installing a low permeability cap over treated and untreated soil within the FPA
- Constructing a new outfall pipe to drain future stormwater from the capped area
- Using passive discharge drains, with treatment as needed, to manage groundwater levels in the area enclosed by the perimeter wall and slurry wall and areas south of the slurry wall following ISS treatment
- Using institutional controls (for example, under the Washington Uniform Environmental Covenants Act) to prohibit activity that could disturb the cap or result in human exposure to contaminated soil and groundwater that remain below the cap

1.5 Statutory Determinations

This action protects human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to this remedial action, is cost effective, and uses permanent solutions and alternative treatment technologies to the extent practicable for this Site. The Selected Remedy satisfies the statutory preference for treatment by reducing toxicity, mobility, or volume of principal threat waste—NAPL in upland soils and groundwater.

The Selected Remedy provides for treatment of contaminated soils and groundwater in the Site's upper aquifer but does not address contamination in the lower aquifer. The upper aquifer is the source of contamination to the lower aquifer. By treating contamination in the upper aquifer, the Selected Remedy will prevent further contamination of the lower aquifer. After the Selected Remedy is implemented, conditions will be monitored in the lower aquifer. A remedial decision to address contamination in the lower aquifer will be made in a future decision document. This RODA provides protectiveness in the interim through institutional controls to prevent use of contaminated groundwater in the lower aquifer.

Because this Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining on Site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after the remedial action is initiated to ensure that the remedy is, or will be, protective of human health and the environment.

1.6 Record of Decision Data Certification Checklist

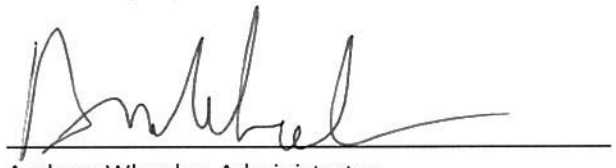
The following information is included in Part 2: Decision Summary of this RODA; additional information can be found in the Administrative Record[1] for the Site.

- Contaminants of concern and their respective concentrations (Section 5)
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and the RODA (Section 6)
- Baseline risks represented by the contaminants of concern (Section 7)
- Cleanup levels established for contaminants of concern (Section 8)
- Methods for addressing source materials constituting principal threats (Section 11)

[1] http://www.epa.gov/superfund/wyckoff-eagle-harbor

- Potential land use that will be available at the Site as a result of the selected remedy (Section 13)
- Estimated capital, annual operations and maintenance, and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected (Section 13)
- Key factors that led to the selection of the remedy (Section 10)

Authorizing Signature



5-10-19

Andrew Wheeler, Administrator
U.S. Environmental Protection Agency

Date

PART 2

Decision Summary

This Decision Summary provides an overview of the cleanup work to date, the contamination remaining in Operable Unit 2 (OU2) soil and Operable Unit 4 (OU4) groundwater, the associated risks to human health and the environment, the cleanup alternatives considered, and the U.S. Environmental Protection Agency's (EPA's) Selected Remedy to address these risks. This Decision Summary also explains how the Selected Remedy fulfills statutory and regulatory requirements. As required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Code of Federal Regulations [CFR] Title 40, Section 300.825[a][2]), this Record of Decision (ROD) Amendment (RODA) will become part of the Site's Administrative Record.

2.1 Site Name, Location, and Brief Description

The Wyckoff/Eagle Harbor Superfund Site (the Site; EPA identification number WAD 009248295) is located on the east side of Bainbridge Island in central Puget Sound (Figure 2-1), at 5350 Creosote Place NE, Bainbridge Island, Washington. The Site includes the former Wyckoff Company wood-treating facility on the south shore of Eagle Harbor, more than 70 acres of contaminated subtidal and intertidal sediments in the harbor, and the upland and in-water portions of a former shipyard on the harbor's north shore. For investigation and cleanup purposes, the Wyckoff Site was divided into the following four OUs:

- **OU1: East Harbor Operable Unit** includes contaminated intertidal and subtidal sediments in the eastern portion of Eagle Harbor associated with wood-treating operations at the former Wyckoff facility.
- **OU2: Soils Operable Unit** includes contaminated surface soil and structures associated with the Former Process Area (FPA) of the Wyckoff facility.
- **OU3: West Harbor Operable Unit** includes the upland areas, and intertidal and subtidal contaminated sediments associated with former shipyard operations on the north shore of Eagle Harbor.
- **OU4: Groundwater Operable Unit** includes contaminated subsurface soil and groundwater associated with operations at the Wyckoff Facility.

OU2 and OU4 are referred to collectively as **OU2/4**, or the **Soils and Groundwater OUs**. An area within OU2/4 where wood-treating operations took place is referred to in this document as the FPA.

EPA is the lead agency for the Site, supported by the Washington Department of Ecology (Ecology). EPA added the Site to the National Priorities List (NPL) in 1987. Extensive investigation and cleanup activities have taken place over the last 32 years. In and around the former Wyckoff facility, EPA has demolished and removed buildings and chemical storage tanks, installed a system to extract and treat contaminated groundwater, constructed a containment wall, and capped contaminated harbor sediments. In the West Harbor (OU3), sediments contaminated with mercury and other toxic metals around a former shipyard were dredged and placed in an on-Site containment facility.

This RODA revises the *Wyckoff/Eagle Harbor Superfund Site Soil and Groundwater Operable Units, Bainbridge Island, Washington, Record of Decision*, signed February 14, 2000 (2000 ROD; EPA, 2000a). The current containment remedy for soils and groundwater within the FPA has prevented large-scale releases of contaminants to Eagle Harbor and Puget Sound. However, the containment system, which includes a perimeter sheet pile wall and groundwater extraction and treatment system, has not stopped contaminants from moving downward into the lower aquifer beneath the FPA and into the intertidal sediments along the East Beach and North Shoal; the current remedy also has high annual operating

costs and is projected to require more than 300 years of additional operation to meet cleanup goals. The modifications to the remedy in this RODA address these concerns.

2.2 Site History and Enforcement Actions

This section of the RODA summarizes the Site history and briefly discusses EPA and state removal, remedial, and enforcement activities.

2.2.1 Early Site History

Suquamish people camped along the Eagle Harbor shoreline for centuries. Two ethnohistoric- and historic-period villages have been recorded, in addition to several precontact clamming, fishing, and hunting camps and short-term activity locations. At least one burial location has been documented (Lewarch, pers. comm., 2016). The Suquamish Tribe reserved the right to gather resources within Eagle Harbor and other areas of its ususal and accustomed fishing area in the 1955 Treaty of Point Elliot. Treaty-reserved rights and resources are critical to the culture, health, and welfare of the Suquamish.

2.2.2 Historical Ship Building and Wood Treating Operations

In 1903, a major shipyard was established on the north shore of Eagle Harbor. After flourishing during World War I, the yard languished during the 1930s. In the 1940s and 1950s, the emphasis was on constructing and repairing military ships and carrying out postwar decommissioning activities.

Wood-treating operations began on the harbor's south shore in 1905. From the early 1900s through 1988, a succession of companies treated wood in the FPA for use as railroad ties, utility poles, and pier pilings and to make wood stave pipes. By 1910, pressure treatment with creosote or bunker oil had begun. In later years, wood was also treated with pentachlorophenol (PCP). Early operations took place on docks and pile-supported buildings. Over time, a series of bulkheads were built and the area behind them filled, creating the existing upland area. For decades, logs were treated using heat and pressure inside retorts, which are long, cylindrical tanks sealed at both ends. Freshly treated wood was removed from the retorts and dried in the open air. Any excess chemical solution that dripped from the wood went directly onto the ground and seeped into the soil and groundwater. This practice began in the mid-1940s and continued until operations ceased in 1988. Other significant contaminant releases resulted from having leaking storage tanks and piping on Site, storing treated wood in the water, and using process wastes and sludge as fill between bulkheads in the 1950s.

2.2.3 Previous Investigations and Cleanup Actions in Operable Units 2 and 4, Upland Soil and Groundwater

In 1984, EPA issued a Unilateral Administrative Order requiring the Wyckoff Company to conduct environmental investigation activities under the Resource Conservation and Recovery Act (RCRA). Data collected at the time revealed the presence of significant soil and groundwater contamination. The Site was added to the NPL in 1987 and a Remedial Investigation (RI) was completed in 1989 (CH2M, 1989). Groundwater extraction and treatment began at selected wells in 1990. In 1993, EPA assumed responsibility for operation and maintenance (O&M) of the groundwater extraction and treatment system because the company was financially unable to do so. Between 1992 and 1994, EPA conducted a time-critical removal action, removing and disposing creosote sludge, contaminated soils, and asbestos; constructing a new bulkhead; and removing and recycling materials left in the retorts and tanks. In 1994, a Focused Remedial Investigation/Feasibility Study (RI/FS) for the Groundwater OU (OU4) (CH2M, 1994) was completed, and an Interim ROD (EPA, 1994a) was issued. The interim ROD required replacing the existing groundwater treatment plant and sealing and abandoning on-Site water supply wells. In 1996 and 1997, most remaining above-grade structures were demolished, and the debris was removed and disposed of off Site.

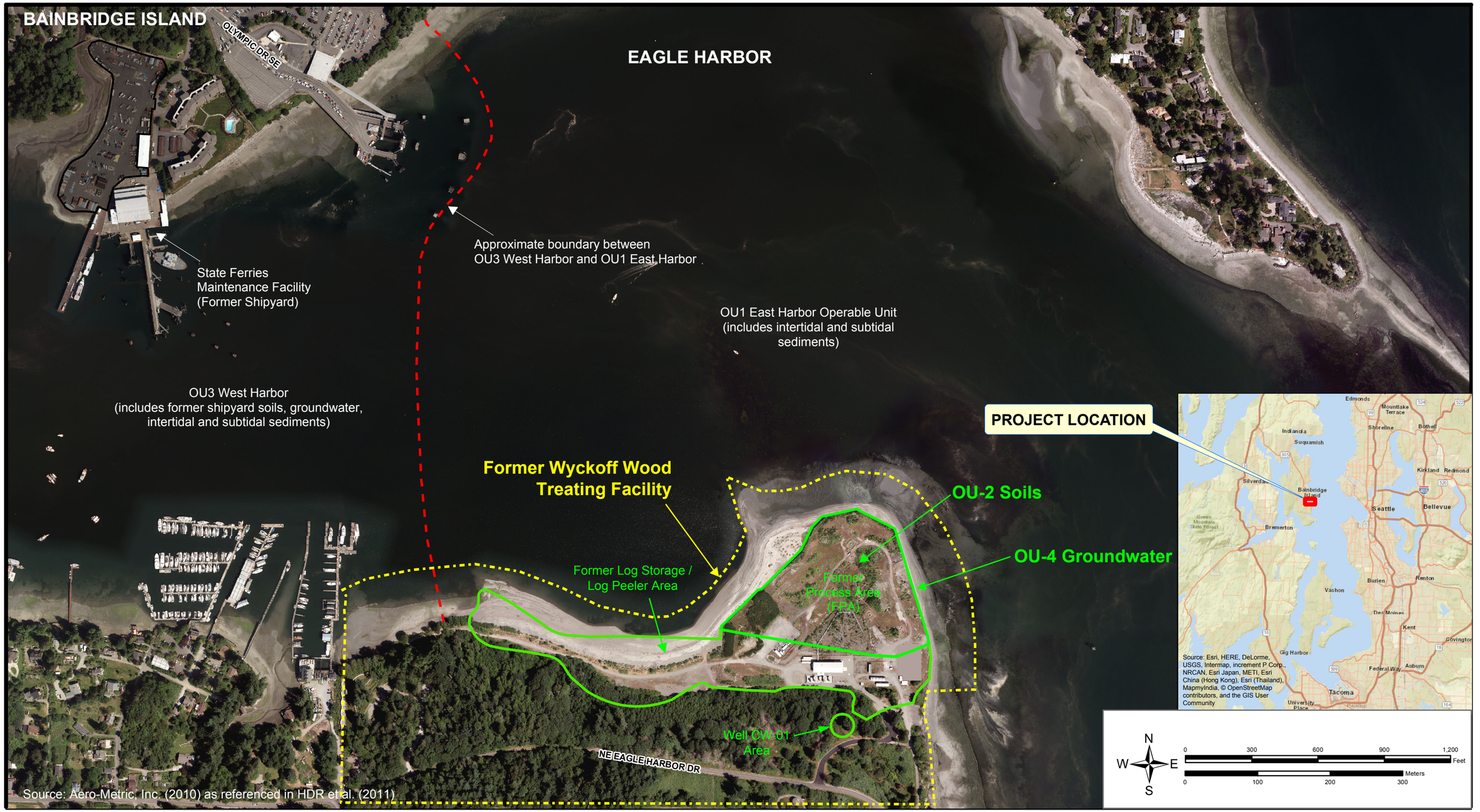


FIGURE 1
Site Location and Operable Units
Record of Decision Amendment for the Wyckoff/ Eagle Harbor Superfund Site
Bainbridge Island, Washington

EPA

In 1998, EPA evaluated thermal treatment technologies, including removing contaminants from soil and groundwater using steam injection with nonaqueous phase liquid (NAPL), groundwater, and soil vapor extraction (hereafter called "steam-enhanced extraction"). With the issuance of the 2000 ROD, EPA defined the boundaries of the Soil and Groundwater OUs based on the extent of contamination. The two OUs, which shared the same boundaries, included the FPA, the former log storage/log peeler area west of the FPA, and a small area of contaminated soil south of the FPA near Well CW01. The primary remedial technology in the 2000 ROD, to be implemented throughout the FPA, was steam-enhanced extraction. The 2000 ROD also included a contingency remedy—containment with a sheet pile wall—to be implemented if a pilot-scale study of the steam-enhanced extraction technology could not meet cleanup goals.

EPA began implementing the remedy in 2000. In 2003, EPA determined that steam-enhanced extraction could not meet the 2000 ROD cleanup goals and began to implement the contingency remedy. Most elements of the 2000 ROD, including the contingency remedy, have been implemented to date. Key components of the 2000 ROD are described below along with a description of the implementation of each component.

- Engineering controls (for example, fencing) and access controls have been implemented to restrict Site use, thereby preventing direct exposure to surface soils.
- An interlocking steel sheet pile wall was constructed around the west, north, and east sides of the FPA in 2000 and 2001. The wall, which is keyed into the aquitard, was designed to contain groundwater during steam-enhanced extraction and was also a key feature of the contingency remedy. The wall is still in place today; however, saltwater is causing the portion of the wall above the mudline to corrode. The May 2018 Beaches and Perimeter Wall RODA (EPA, 2018a) included a new concrete wall to replace the aging structure.
- In 2002 and 2003, EPA conducted a pilot study of steam-enhanced extraction in the FPA. The study revealed that steam-enhanced extraction could not meet the 2000 ROD cleanup goals. EPA then began to implement the contingency remedy.
- Contaminated soils from the area around Well CW01 were excavated and consolidated with contaminated soils in FPA in 2002. Cleanup levels (CULs) have been achieved in this area, and no further remediation is required.
- In 2002, the wooden bulkhead along the shoreline west of the FPA was demolished and contaminated soils from the log storage/log peeler area were excavated and consolidated with contaminated soils in the FPA; this action converted upland soil to intertidal beach habitat. Thereafter, the area was managed as part of OU1 East Harbor . CULs have been achieved in this area, and no further remediation is required.
- The groundwater extraction and treatment system installed pursuant to the 1994 Interim ROD (EPA, 1994a) is still in operation. The system has been upgraded and now consists of nine recovery wells screened in the upper aquifer, which draw groundwater and NAPL away from the Site perimeter and toward the extraction wells. Groundwater extraction also maintains an upward vertical gradient, minimizing the transport of contaminants from the upper aquifer to the lower aquifer. The system is operated continuously. Groundwater recovered from the extraction wells is treated in an on-Site treatment plant prior to discharge in Puget Sound, while recovered NAPL is collected and shipped off Site for incineration. Ecology began operating the system in 2012 when EPA agreed to evaluate additional cleanup actions to remove or treat NAPL in OU2/4.
- The final Site cap, a feature of both the primary and contingency remedies in the 2000 ROD, has not been constructed. Anticipating that additional cleanup actions could require excavation, EPA deferred construction of the final Site cap.

- Within the FPA, monitoring groundwater conditions in the upper and lower aquifers continues. Outside the FPA, groundwater monitoring was discontinued following successful cleanup actions in the former log storage and log peeler area and the Well CW01 area.
- Institutional controls (ICs) included in the 2000 ROD have not been put in place.

A draft Focused Feasibility Study (FFS), including a new assessment of the nature and extent of NAPL contamination in OU2/4 and an evaluation of potential remedial technologies, was completed in 2015 (CH2M, 2015). In April 2016, EPA issued a Proposed Plan (EPA, 2016a) recommending changes to the cleanup decision for both OU1 intertidal sediments and OU2/4 soils and groundwater.

In May 2018, EPA issued the Beaches and Perimeter Wall RODA (EPA, 2018a), revising the remedy for OU1 and a portion of OU2/4. The May 2018 RODA included two changes to the OU2/4 remedy: improving the Site's access road and replacing the aging steel perimeter sheet pile wall.

2.2.4 Previous Investigations and Cleanup Actions in Operable Unit 1, East Harbor

The 1989 RI revealed extensive polycyclic aromatic hydrocarbon (PAH) contamination of surface and shallow subsurface sediments in Eagle Harbor. To address this contamination, EPA implemented a non-time-critical removal action, capping more than 54 acres of contaminated sediments under a thick (1- to 5-foot) layer of clean sand. Capping began in September 1993 and was completed in March 1994. Capping was selected as the primary remedy for sediment contamination in the OU1 1994 ROD (EPA, 1994b), with monitored natural recovery in the intertidal beaches. The cap was extended in several phases and now covers more than 70 acres.

As described in Section 2.3, EPA remediated the former log storage/log peeler area in 2002. This created approximately 2 acres of new intertidal habitat west of the FPA. Unfortunately, this action did not remove all source material from this area. In 2005, EPA began receiving reports from citizens about odors and sheen on the beach west of the FPA. EPA investigated, determined the extent of residual creosote contamination, and designed a three-layer cap called an exposure barrier system to cover the contaminated portion of the beach. EPA documented this additional cleanup action in a 2007 Explanation of Significant Differences (ESD) (EPA, 2007). The 2007 ESD amended the 1994 ROD. The exposure barrier system was built in 2008.

In 2017, EPA repaired a portion of the original cap in Eagle Harbor. The repair included placing new sand over 9 acres of the cap and armoring 4 acres of the repaired area with rock to prevent future erosion.

In the 2018 Beaches and Perimeter Wall RODA, EPA excavated and capped portions of the intertidal beaches north and east of the FPA, where monitored natural recovery had not met cleanup goals. The 2018 Beaches and Perimeter Wall RODA also included improving the Site's access road and replacing the perimeter steel sheet pile wall. Design of all three actions—beach excavation and capping, road upgrades, and wall replacement—is underway.

2.2.5 Previous Investigations and Cleanup Actions in Operable Unit 3, West Harbor

Sampling for the 1989 RI revealed an area of metal-contaminated sediment offshore of the shipyard on the harbor's north shore. EPA issued an initial cleanup decision for the shipyard in 1992 (EPA, 1992), then amended it in 1995 (EPA, 1995). The final remedy included upland source control measures, including soil stabilizing and capping soil; constructing a tidal barrier system to minimize contaminant seeps from the Site to the adjacent beach; capping contaminated sediments with dredging and on-Site disposal; and implementing ICs. The cleanup was completed in 1997. Annual monitoring ensures that the remedial measures remain in place and continue to be protective.

2.2.6 History of Enforcement Actions

EPA issued an order requiring the Wyckoff Company to conduct environmental investigations in 1984. In July 1988, EPA ordered the company to install groundwater extraction wells and a groundwater treatment plant to halt continuing releases of wood-treating contaminants to Eagle Harbor. Wyckoff ceased operations in 1988, and the company was renamed Pacific Sound Resources (PSR).

A settlement with PSR, which covered both the Wyckoff facility and a wood-treating facility in Seattle, was embodied in a consent decree entered in federal district court in August 1994. The decree created the PSR Environmental Trust, into which the heirs of the Wyckoff Company founders, owners, and operators placed all ownership rights and shares into the company. This allowed the trust to maximize liquidation of all company assets. The trust beneficiaries are the U.S. Department of Interior, National Oceanic and Atmospheric Administration, and Suquamish and Muckleshoot Tribes as Natural Resource Trustees, as well as EPA (the Superfund trust fund) for reimbursement of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial costs.

Proceeds from the trust funded early cleanup activities and natural resource restoration projects, both at the Wyckoff facility and at the sister facility located in Seattle. However, collections from the trust, which totaled less than $20 million, were dwarfed by substantial cleanup costs at the two facilities. To date, EPA has spent more than $183 million on Site investigations and cleanup actions at the Site. In 2012, EPA conducted a search for additional potentially responsible parties and did not discover any other viable parties who could be liable for EPA response costs.

2.3 Community and Tribal Participation

EPA and Ecology coordinated closely throughout the development of the OU2/4 FFS report and held regular meetings with a community stakeholder group to share investigation results and answer questions from community members. The draft final OU2/4 FFS, addressing contamination remaining in upland soil and groundwater, was made available to the public in April 2016, along with the *Proposed Plan for Amending the Records of Decision for the Wyckoff/Eagle Harbor Superfund Site (Operable Units 1, 2, and 4)* (EPA, 2016a). These, as well as other relevant Site documents, can be found in the Wyckoff/Eagle Harbor Administrative Record, which is available for the public to review on EPA's Superfund project website.[2] The Administrative Record is also available at the following locations:

- EPA's regional office, 1200 Sixth Avenue, Seattle, Washington, 98101
- Bainbridge Island Public Library, 1270 Madison Avenue North, Bainbridge Island, Washington, 98110

Notice of the availability of the Proposed Plan and associated documents was published in the *Bainbridge Islander* on April 22, 2016, along with notice of a public meeting to be held on April 27. Information about the Proposed Plan and public meeting was sent by email to 553 individuals who had signed up previously to receive project updates by email. A fact sheet summarizing the Proposed Plan and announcing the public meeting was mailed to 875 individuals on the Site's mailing list. Notice of the public meeting was advertised in the City of Bainbridge Island's weekly community newsletter and in the Bainbridge Islander. Fliers informing the community about the public meeting were posted at the Site and on community notice boards at the grocery store, the ferry terminal, the library and in coffee shops and other high traffic locations. Bloomberg News ran a story about the Proposed Plan and public meeting on April 26.

A public meeting was held at Bainbridge Island City Hall on April 27, 2016. The EPA accepted verbal and written comments at the public meeting. The Kitsap Sun ran an article about the Proposed Plan on May

[2] http://www.epa.gov/superfund/wyckoff-eagle-harbor

6. The public comment period, originally scheduled to end on May 31, was extended to June 30 after EPA received a written request to extend the comment period. EPA's responses to comments received during the public comment period for the Proposed Plan is included in the Responsiveness Summary (Part 3), which is part of this RODA.

Federal, Tribal, and state natural resource trustee agencies participated in the 1994 federal consent decree and used the funds recovered to restore eelgrass habitat east of the FPA. The EPA has continued to keep the trustee agencies appraised of cleanup efforts and planning and sought input from them on the Proposed Plan.

The Suquamish Tribe, as a sovereign nation, has engaged in government to government consultations with EPA on previous cleanup decisions at the Wyckoff/Eagle Harbor Site. In a letter dated November 27, 2018, EPA offered to consult with the Tribe on this RODA. The Tribe declined EPA's offer of formal consultation and requested continued coordination at the staff level. EPA will continue to coordinate with the Tribe throughout the cleanup process, including design, construction and long-term monitoring.

2.4 Scope and Role of Response Action

The overall scope of EPA's remedial strategy for the Wyckoff/Eagle Harbor Site is described in Section 1. Consistent with that strategy, this RODA modifies the current cleanup decision for the Soils and Groundwater Operable Units (OU2/4). It makes no changes to the cleanup decision for the East Harbor Operable Unit (OU1) or the West Harbor Operable Unit (OU3). This RODA is a companion document to the May 2018 Beaches and Perimeter Wall RODA. Together, the May 2018 RODA and this RODA include remedial decisions for all the cleanup needs documented in the April 2016 Proposed Plan. EPA chose to issue two RODAs following the April 2016 Proposed Plan instead of one RODA because of the breadth and complexity of the proposed cleanup actions and the need to quickly implement the actions described in the May 2018 RODA.

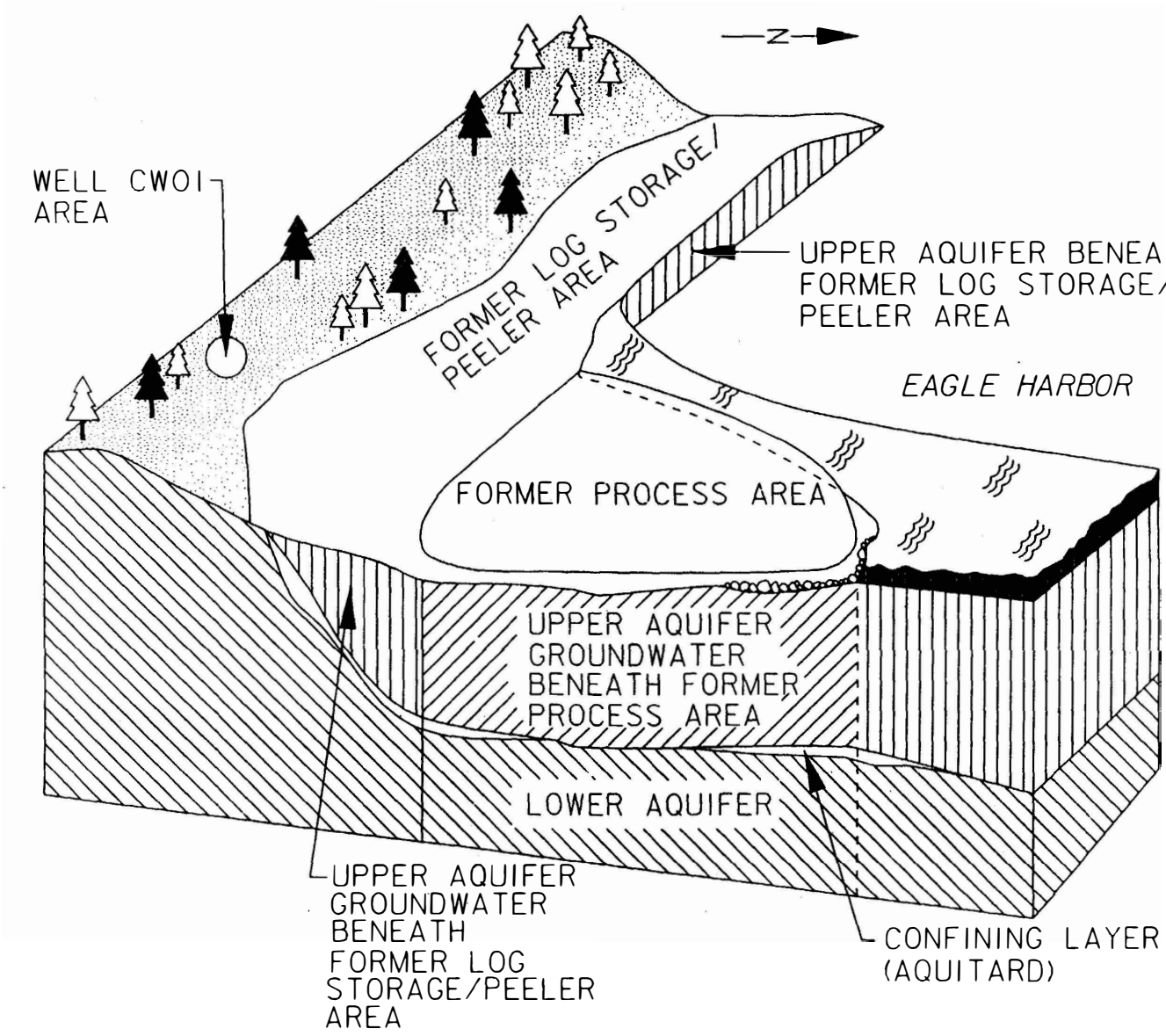
2.4.1 Changes to the Cleanup Decision for Operable Units 2/4, Upland Soils, and Groundwater

The Selected Remedy presented in this RODA revises the cleanup decision in the 2000 ROD for soil and groundwater in the FPA, and includes:

- A new cleanup technology—in-situ solidification/stabilization (ISS)—to treat NAPL contaminated soil and groundwater in the FPA.
- A groundwater cutoff wall along the southern edge of NAPL contamination in the FPA. The cutoff wall will connect the ends of the U-shaped perimeter sheet pile wall and divert clean upgradient groundwater around the area of contamination.
- Updates to the soil CULs.

Changes to remedial action objectives and chemical-specific CULs are discussed in Section 8.
Other features of the 2000 ROD remain in effect, including:

- The boundaries of the Soil and Groundwater Operable Units. In the 2000 ROD, EPA identified 18 acres within the 57-acre facility where soil and/or groundwater were contaminated, requiring remedial action. As shown on Figure 2-2, the operable units share the same boundaries and include the FPA, the former log storage/log peeler area, and a small area around Well CW01. As described in Section 2.2, the former log storage/log peeler area and the area around Well CW01 have already remediated. There is no new information to suggest that the boundary of either operable unit should be expanded.



Notes:
Not to scale.
Figure sourced from 2000 ROD (EPA, 2000a).

FIGURE 2
Soil and Groundwater OU Components
Record of Decision Amendment for the Wyckoff/ Eagle Harbor Superfund Site
Bainbridge Island, Washington

- A final Site cap to cover contaminated soil in the FPA. The 2000 ROD provided few details about the cap. This RODA specifies a low permeability layer in the cap to prevent surface water infiltration, defines the area to be capped as the entire area within the fully encircling perimeter wall (approximately 8 acres), and includes a stormwater collection system to convey rainwater off the surface of the cap.
- ICs to protect the remedial measures and prevent exposure to subsurface contamination remaining beneath the final Site cap.
- Monitoring groundwater in the FPA, including in the lower aquifer.

2.4.2 Role of Response Action in Overall Cleanup at the Wyckoff/Eagle Harbor Superfund Site

As described in Sections 2.2 through 2.4, extensive cleanup actions have been completed since the Site was placed on the NPL in 1987. The May 2018 RODA selected additional cleanup actions in OU1 and in OU2/4, including dredging and capping contaminated beach sediments, upgrading the Site's access road, and replacing the aging perimeter sheet pile wall. Design of these additional actions has begun, and construction of the road upgrades is expected to begin in 2019. These actions, along with the Selected Remedy in this RODA, address intertidal sediments and contaminated soil and upper aquifer groundwater that poses an unacceptable risk to human health and the environment. None of the cleanup decisions signed to date, including this RODA, select CUL or cleanup actions for groundwater in the lower aquifer. Therefore, this RODA is an interim cleanup decision. Contamination in the lower aquifer will be addressed in the final ROD for the Site.

2.5 Site Characteristics

This section describes the physical setting of OU2/4, as well as the nature and extent of contamination remaining in FPA soil and groundwater.

2.5.1 Physical Setting

The former Wyckoff wood-treating facility is located on the south shore of Eagle Harbor. The property covers 54 acres, including 13 acres of relatively flat land where historical wood-treating operations occurred (the FPA). The remainder of the property consists of a steeply sloped, wooded hillside. Eagle Harbor Drive, which runs east/west along the top of the wooded hillside, is at an elevation approximately 100 feet above the FPA.

The offshore portion of the Site consists of intertidal beaches and subtidal areas of Eagle Harbor. Intertidal sediments consist of interbedded sands, gravels, and silts. The beaches extend seaward from the sheet pile wall, ranging in elevation from +5 feet Mean Lower Low Water (MLLW) near the base of the wall to -2 feet MLLW. Beyond the -2 MLLW elevation, the sediment surface slopes steeply downward, transitioning to deeper subtidal zones of Eagle Harbor north of the FPA, and to Puget Sound east of the FPA.

2.5.2 Hydrogeology

This section summarizes the Site's hydrogeology. Based on geologic logging of the soil and monitoring/recovery well boreholes, the deepest of which is 127 feet below ground surface (bgs), there are four primary hydrostratigraphic units, the: vadose zone, upper aquifer, aquitard, and lower aquifer. These units are shown along with contaminant sources and transport pathways in Figure 2-3.

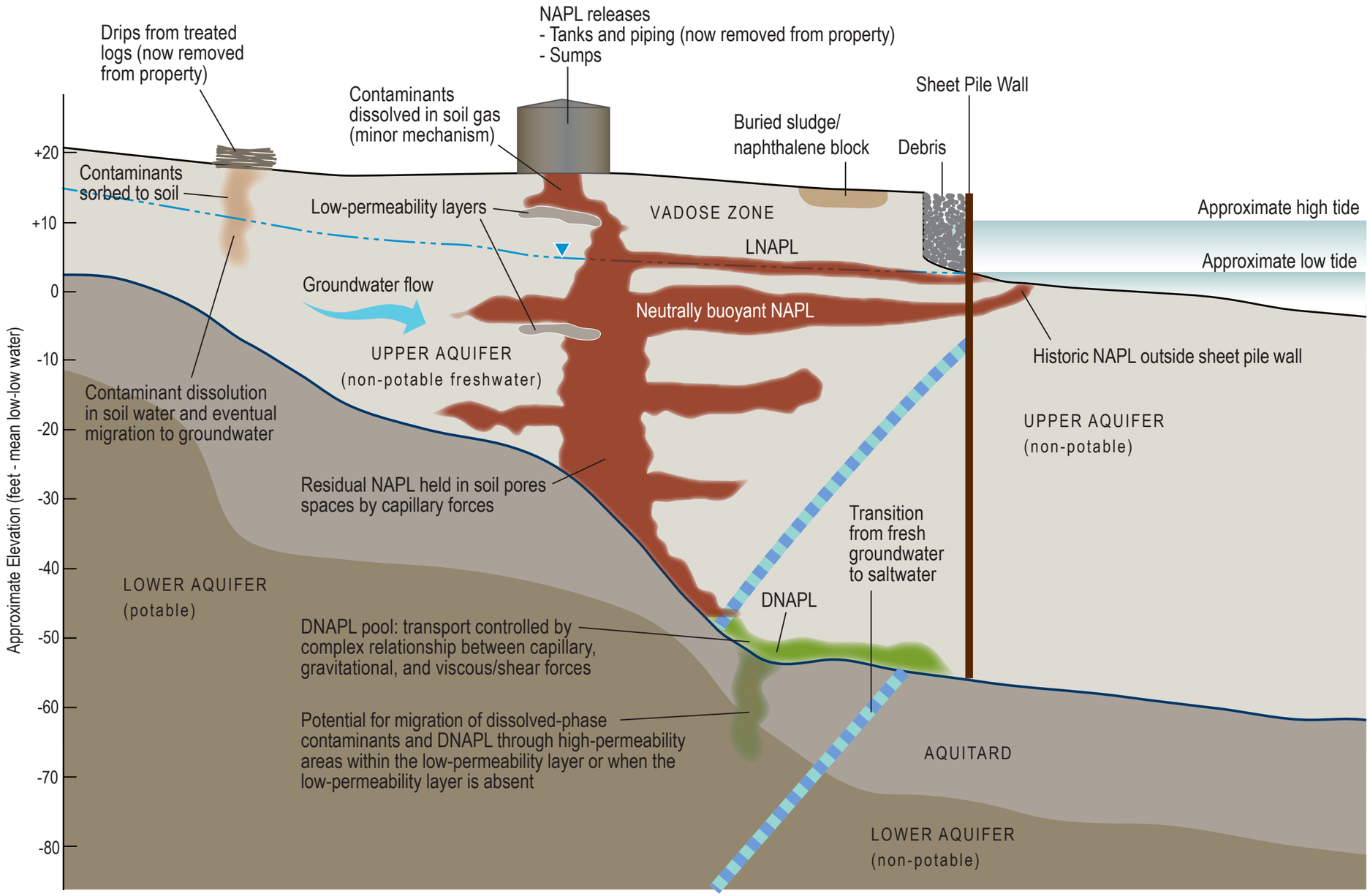


FIGURE 3
Conceptual Site Model
Record of Decision Amendment for the Wyckoff/ Eagle Harbor Superfund Site
Bainbridge Island, Washington

In the FPA, the vadose zone (the unsaturated zone above the water table) generally consists of fill material that extends from the ground surface to depths ranging from 6 feet in the west portion of the FPA to 13 feet in the northeast portion. The vadose zone thickness varies with seasonal and tidally influenced upper aquifer groundwater elevations.

The upper aquifer consists primarily of sand and gravel with groundwater occurring under unconfined or water table conditions. Groundwater elevations range from about 7.5 to 10 feet MLLW under non-pumping, seasonal low conditions. Before the perimeter sheet pile wall was installed, daily tidal fluctuations significantly influenced upper aquifer groundwater elevations, especially along the shoreline. Tidal changes resulted in water table fluctuations ranging from 1 to 10 feet. After the perimeter sheet pile wall was installed in 2001, tidal influence diminished, with water levels in shallow upper aquifer wells fluctuating less than 1 foot and water levels in deeper wells fluctuating between 2.5 (wells CW03, VG-3U) and 7 feet (well VG-2U).

Before the perimeter sheet pile wall was installed, the overall groundwater flow direction within the FPA was from the inland area toward Eagle Harbor and Puget Sound with temporary flow reversals along the shoreline during high tide. The perimeter wall has altered groundwater flow in the upper aquifer and greatly restricts interaction with saline water outside the wall, influencing the aquifer's hydraulic response to containment system pumping, seasonal water level changes and daily tidal cycles. Together, the perimeter wall and hydraulic containment pumping influence the flow of upper aquifer groundwater within the FPA, creating an inward and upward groundwater flow pattern. The wall minimizes but does not entirely prevent NAPL and dissolved phase contaminant transport from the FPA to Eagle Harbor and Puget Sound. Outside the FPA, groundwater flow is from the inland area toward Eagle Harbor and Puget Sound.

The aquitard is a dense layer of marine silt, glacial deposits, and nonmarine clay that separates the upper and lower aquifers. The top of the aquitard, which dips north-northeast, extends from near ground surface in the south-central portion of the Wyckoff facility to approximately 90 feet bgs along the northern edge of the FPA. The aquitard's thickness generally ranges from 10 to 50 feet (CH2M, 2014a). In the southeast corner of the FPA, the aquitard is not visibly evident.

The lower aquifer consists of sand, with small amounts of silt, clay, and gravel. While the thickness and depth to the bottom of the lower aquifer have not been determined at the Site, it is believed that it extends to a depth of approximately 200 or 250 feet bgs, based on regional geologic data and geologic log for well 01-CT01. The direction of groundwater flow in the lower aquifer is from the inland area towards Eagle Harbor and Puget Sound. The sheet pile wall and upper aquifer hydraulic containment pumping do not influence horizontal groundwater flow patterns in the lower aquifer.

2.5.3 Contaminant Transport Pathways

Both upper aquifer and lower aquifer groundwater quality within the FPA have been impacted by NAPL and dissolved contaminants. In the upper aquifer, transport of contaminants beyond the FPA is limited by the perimeter sheet pile wall, hydraulic containment pumping, and the aquitard. The aquitard slows but does not completely prevent contaminant transport from the upper aquifer into the lower aquifer. There are sandy layers within the aquitard that contain dense nonaqueous phase liquid (DNAPL). DNAPL also occurs in lower aquifer groundwater over a small area near the northern edge of the FPA. Contaminant transport in the lower aquifer is slowed by daily tidal induced gradient reversals. Contaminant concentrations in lower aquifer groundwater in the northern part of the FPA have remained stable over the past 16 years.

2.5.4 Contaminants of Concern

The primary wood preservative used at the Wyckoff facility was creosote—a thick, oily liquid distilled from coal tar. Creosote contains several hundred individual chemicals including PAHs such as

naphthalene and benzo(a)pyrene. Creosote in the soil and groundwater occurs primarily in the form of a NAPL. Both light NAPL (LNAPL) and DNAPL occur in upland soil and groundwater. LNAPL is found in the top portion of the upper aquifer, where it moves up and down with seasonal and tidally induced groundwater elevation changes, creating a smear zone of contamination in the soil. DNAPL is found in the deeper portions of the upper aquifer and in the lower aquifer.

PCP was also used as a wood preservative at the Wyckoff facility. PCP is found in LNAPL and in groundwater. Dioxins/furans were generated at the Wyckoff facility as a by-product when wood contaminated with creosote and other chemicals was burned for fuel. Dioxins/furans are also impurities in PCP. Dioxins/furans are found in soil, LNAPL, and DNAPL.

In the 2000 ROD, EPA stated that "for the purposes of cleanup, it is assumed that other contaminants are co-located with the PAHs and PCP and will be remediated along with these primary contaminants of concern." This assumption remains true today. Contaminants including PCP and dioxins/furans are co-located with the PAHs, and the PAHs are present primarily in the NAPL.

The contaminants of concern (COCs) in upland soil and groundwater were established in the 2000 ROD. In soil, the COCs are PAHs, PCP, and dioxins/furans. In groundwater, the COCs are PAHs and PCP.

2.5.5 Nature and Extent of Contamination Remaining in Soil and Groundwater (OU2/4)

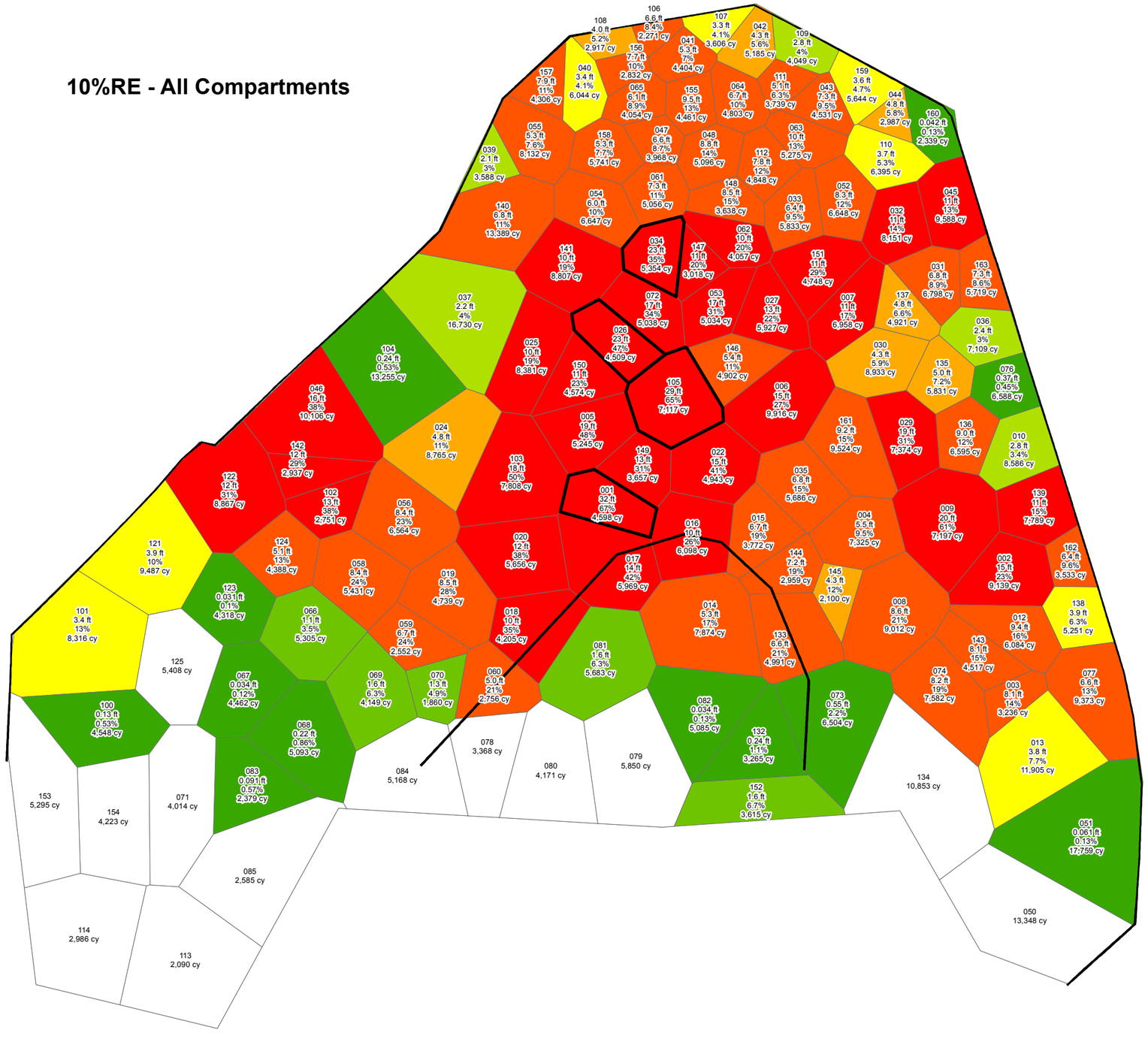
In 2013, EPA investigated the extent of NAPL contamination in upland soil and groundwater in the FPA using the Tar-specific Green Optical Scanning Technology, a laser-induced fluorescence probe, in soil borings as deep as 85 feet below the ground surface. The investigation revealed that:

- Approximately 650,000 gallons of NAPL remain in the upper aquifer.
- The aquitard restricts NAPL migration from the upper aquifer to the lower aquifer in the FPA.
- Elevated LIF readings along the inside of the sheet pile wall suggest that along much of its length, the wall is retaining NAPL. The wall is keyed into the aquitard along most of the FPA perimeter to minimize NAPL from migrating beneath the wall. However, a subsequent (2018) intertidal beach investigation found several active NAPL seeps, suggesting that NAPL may be leaking through the wall, most likely through unsealed sheet pile wall joints.
- NAPL is not evenly distributed. As shown in Figure 2-4, NAPL is thickest in the center of the FPA.
- Within the FPA, approximately 80 percent of the NAPL above the aquitard is within 25 feet of the ground surface or at depths lying within 10 feet of the aquitard.

EPA regularly monitors groundwater contamination in the lower aquifer. The upper aquifer is sampled infrequently; the last sampling event occurred in 2014. Data from sampling of the upper and lower aquifers reveals that:

- Groundwater in the upper aquifer remains heavily contaminated with PAHs. The CUL from the 2000 ROD (EPA, 2000a) for high-molecular weight PAHs (HPAHs) is 0.254 micrograms per liter (µg/L). During the most recent (2014) sampling event, this CUL was exceeded in 15 of the 18 wells sampled. The maximum concentration was more than 3,000 times the CUL. The concentration of HPAHs in NAPL samples was as high as 32,445,000 micrograms per kilogram (µg/kg) (3.2 percent) in LNAPL and 57,330,000 µg/kg (5.7 percent) in DNAPL. A summary of the 2014 upper aquifer sampling data is provided in Table 2-1.
- In 2015, the PCP concentration in upper aquifer groundwater exceeded the 2000 ROD CUL of 4.9 µg/L in 6 of the 18 wells sampled. PCP was not detected in DNAPL, but it was measured in LNAPL at concentrations ranging from 1,600 to 1,900 µg/kg.

10%RE - All Compartments



LEGEND

Thickness of Affected TarGOST Sample (ft)

- >0 - 1.0 (1.4 acres)
- 1.0 - 2.0 (0.5 acres)
- 2.0 - 3.0 (0.4 acres)
- 3.0 - 4.0 (0.7 acres)
- 4.0 - 5.0 (0.4 acres)
- 5.0 - 10 (2.9 acres)
- >10 (2.7 acres)
- Thickness of Affected TarGOST Sample Greater than 20 ft
- No impacts above 10%RE

Labels:

135 TarGOST sample ID number
3.6 ft Length of TarGOST core with NAPL measured above 10%RE
17% Percentage of soil in polygon impacted by NAPL
1,765 cy Total volume of polygon (cubic yards)

N

0 50 100 200 Feet

FIGURE 2-4
Thickness of NAPL in the Upper Aquifer
Record of Decision Amendment for the Wyckoff/ Eagle Harbor Superfund Site
Bainbridge Island, Washington

- Groundwater contamination in the lower aquifer is not extensive. Both DNAPL and dissolved contaminant concentrations above CUL occur over a small portion of the FPA. Using acenaphthene as an indicator, Figure 2-5 shows the extent of PAH contamination in lower aquifer groundwater observed in May 2018. Acenaphthene occurs at concentrations above the CUL of 3.0 µg/L consistently over time and across a larger area than any other COC. Groundwater in this portion of the lower aquifer is affected by saltwater intrusion and is nonpotable. The position of the freshwater/saltwater boundary, also shown on Figure 2-5, varies tidally and seasonally. A summary of the most recent (2018) lower aquifer sampling data is provided in Table 2-2.
- The contaminant plume in the lower aquifer currently appears stable.

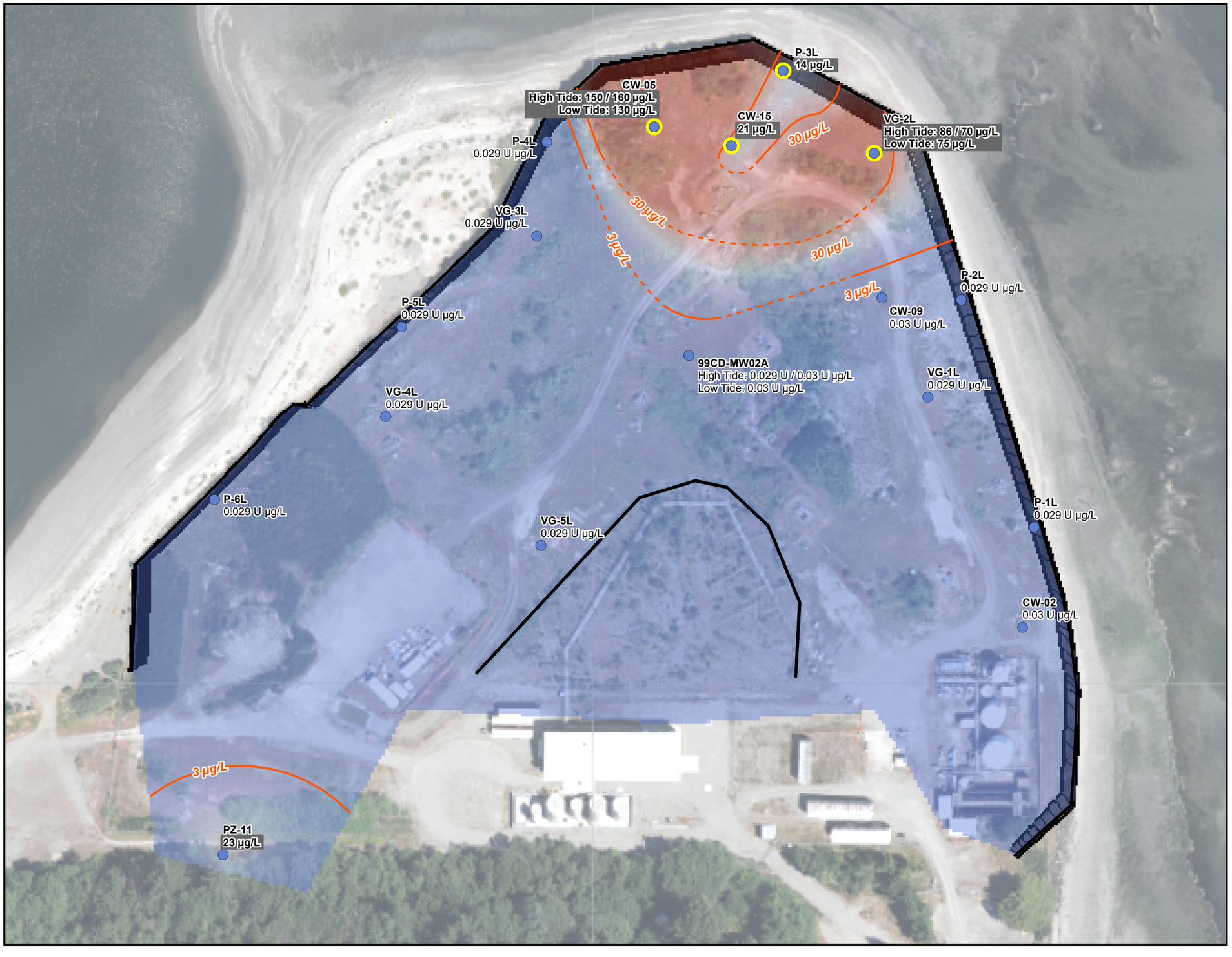
Table 2-1. Contaminant Concentrations in Upper Aquifer Groundwater Based on 2014 Sampling Results

Contaminant of Concern	CULs (µg/L)[a, b]	Number of Detections/ Samples	Number of Samples Exceeding CULs	Average Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)
Total PAHs[a]					
Total LPAH	NS	18/18	0	2,077	7,875
Total HPAH	0.254	18/18	14	115	776
Total PAH	NS	18/18	0	2,191	8,367
LPAHs					
Fluorene	3	16/18	13	112	510
Acenaphthene	3	16/18	13	206	750
Acenaphthylene	NS	16/18	0	4.0	11
Anthracene	9	17/18	7	19.2	100
Naphthalene	83	16/18	10	1,577	6,700
Phenanthrene	NS	16/18	0	158	920
HPAHs					
Benzo(a)anthracene	0.0296	12/18	10	9.9	69
Benzo(a)pyrene	0.0296	12/18	11	2.9	20
Benzo(g,h,i)perylene	NS	9/18	0	0.72	4.8
Benzo[b]fluoranthene	0.0296	12/18	9	5.5	39
Benzo[k]fluoranthene	0.0296	11/18	10	1.6	12
Chrysene	0.0296	12/18	12	7.7	54
Dibenzo[a,h]anthracene	0.007	8/18	7	0.30	2.1
Indeno(1,2,3-cd)pyrene	0.0296	10/18	8	0.72	5.2
Fluoranthene	3	17/18	11	53	350
Pyrene	15	16/18	7	33	220
Phenol					
Pentachlorophenol	4.9	18	2	15	240

Source: CH2M (2014b).

[a] Total LPAH concentration equals the sum of the LPAH compound concentrations; otal HPAH concentration equals the sum of the HPAH compound concentrations; The total PAH concentration equals the sum of the total LPAH and total HPAH compound concentrations. PAH compounds with nondetect results are not included in the total concentration.
[b] Source: EPA (2000a).

µg/L micrograms per liter
CUL cleanup level
HPAH high-molecular weight polycyclic aromatic hydrocarbon
LPAH low-molecular weight polycyclic aromatic hydrocarbon
NS no samples collected for analysis
PAH polycyclic aromatic hydrocarbon



LEGEND

Acenaphthene Measured May 2018 (µg/L)

- Lower Aquifer Monitor Well
- Acenaphthene Isopleth (3 and 30 µg/L)
- Inferred Acenaphthene Isopleth
- NAPL Observed in Well During 2018 Sampling Event

Interpolated Acenaphthene Concentration (µg/L)

High : 160

Low : 0

Notes:
/ ## indicates parent and duplicate samples
Bold values = Acenaphthene was detected in well.
Shaded/Bold values = Acenaphthene exceeds groundwater cleanup level of 3.0 µg/L established in the Wyckoff ROD 2/2000.
µg/L = micrograms per Liter
U = The analyte was not detected at or above the reported value.

N

0 50 100 200 Feet

FIGURE 5
Acenaphthene Concentrations Measured May 2018
Record of Decision Amendment for the Wyckoff/ Eagle Harbor Superfund Site
Bainbridge Island, Washington

EPA

Table 2-2. Contaminant Concentrations in Lower Aquifer Groundwater Based on 2018 Sampling Results

Contaminant of Concern	CULs (µg/L)[a, b]	Number of Detections/ Samples	Number of Samples Exceeding CULs	Average Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)
Total PAH[d]					
Total LPAH	NS	8/17	0	134	425
Total HPAH	0.254	7/17	4	12.8	35
Total PAH	NS	10/17	0	127	439
LPAHs					
Fluorene	3	5/17	3	16.3	54
Acenaphthene	3	5/17	5	58.8	150
Acenaphthylene	NS	7/17	0	0.78	2.3
Anthracene	9	6/17	0	2.3	5.5
Naphthalene	83	5/17	2	113	350
Phenanthrene	NS	6/17	0	19.6	55
HPAHs					
Benzo(a)anthracene	0.0296	4/17	4	1.13	2.9
Benzo(a)pyrene	0.0296	4/17	4	0.26	0.59
Benzo(g,h,i)perylene	NS	3/17	0	0.07	0.11
Benzo[b]fluoranthene	0.0296	4/17	4	0.38	0.86
Benzo[k]fluoranthene	0.0296	3/17	3	0.16	0.26
Chrysene	0.0296	4/17	4	0.84	2.1
Dibenzo[a,h]anthracene	0.007	2/17	2	0.04	0.05
Indeno(1,2,3-cd)pyrene	0.0296	3/17	3	0.07	0.12
Fluoranthene	3	7/17	4	4.8	17
Pyrene	15	5/17	0	4.3	11
Phenol					
Pentachlorophenol	4.9	1/17	0	3.5	3.5

Source: CH2M (2019).

[a] The total LPAH concentration equals the sum of the LPAH compound concentrations; The total HPAH concentration equals the sum of the HPAH compound concentrations; The total PAH concentration equals the sum of the total LPAH and total HPAH compound concentrations. PAH compounds with nondetect results are not included in the total concentration.
[b] EPA (2000a).

µg/L micrograms per liter
CUL cleanup level
HPAH high-molecular weight polycyclic aromatic hydrocarbon
LPAH low-molecular weight polycyclic aromatic hydrocarbon
NS no samples collected for analysis
PAH polycyclic aromatic hydrocarbon

2.6 Current and Potential Future Land and Groundwater Use

The City of Bainbridge Island purchased the Wyckoff property with the intent to use the land, including the FPA, as a park. The purchase took place in phases over several years beginning in 2004. Most of the property is already in use as a park. Pritchard Park includes hiking trails across the wooded hillside between Eagle Harbor Drive and West Beach, parking lots, and a view point looking east across Puget Sound. The Bainbridge Island Japanese American Exclusion Memorial occupies the far western end of the property. Today, only the FPA remains fenced and inaccessible to the public. The Bainbridge Island Metropolitan Park and Recreation District plans to expand the park to incorporate the FPA once the cleanup is complete. Future land use is anticipated to remain recreational/open space.

Consistent with the 2000 ROD, all upper aquifer groundwater in the FPA is considered non-potable. Near the FPA's Eagle Harbor and Puget Sound shorelines, upper aquifer groundwater is subject to saltwater intrusion through the perimeter sheet pile joints, with total dissolved solids (TDS) concentrations greater than 10,000 mg/L. Saline portions of the upper aquifer are considered non-potable/Class III groundwater. Over the rest of the FPA, TDS concentrations are less than 10,000 mg/L, but the groundwater is still considered non-potable due to low yield and/or proximity to salt water. Over a large part of the FPA, the upper aquifer is less than 20 feet thick. It is expected that a hypothetical drinking water well installed in this area would not meet the State's 0.5 gallon per minute (gpm) yield threshold for potable groundwater (WAC 173-340-720). Sustained pumping from thicker portions of the upper aquifer would draw saltwater into a hypothetical well if the perimeter sheet pile wall was absent.

Groundwater in the lower aquifer is mostly potable, except in the northern tip of the FPA, where is it impacted by saltwater and Site contaminants.

All potable water-bearing geologic units underlying Bainbridge Island are considered part of an island-wide aquifer system, designated by EPA in 2013 as a Sole Source (Class I) Aquifer (EPA, 2013). The aquifer system supplies drinking water to the island's more than 23,000 residents.

The nearest operating municipal production well is located approximately 1,000 feet south and upgradient of the FPA, and there is an on-Site community well near the western edge of Pritchard Park. EPA installed an on-Site water supply well west of the FPA in 2002 to support the steam injection pilot study. The supply well, installed in a deep aquifer below the lower aquifer and screened at a depth of 460 to 500 feet, is used for groundwater treatment plant operations (for example, to backwash filters) but it is not used for drinking water. None of these wells have been impacted by Site contaminants. Monitoring wells located between these wells and the lower aquifer contaminant plume are sampled annually to confirm the plume is not spreading toward groundwater production wells.

2.7 Summary of Site Risks

Baseline human health and ecological risk assessments were performed for the soil and groundwater OUs in the mid-1990s. The results were presented in a 1997 RI report (CH2M, 1997). EPA did not perform a new baseline human health or ecological risk assessment to support more recent NAPL characterization and remedy selection efforts.

2.7.1 Human Health Risk from Exposure to Upland Soil

The 1997 human health risk assessment showed excess lifetime cancer risks above EPA's target range of 10^{-4} to 10^{-6} for exposure (including ingestion and inhalation) to surface and shallow subsurface soils. The risk assessment evaluated risks for residential exposure, based on a 1995 advisory committee recommendation that the majority of the facility (the 39-acre hillside area) be zoned for residential use.

Carcinogenic PAHs (cPAHs) including benzo(a)anthracene, benzo(b&k)fluoranthene, and benzo(a)pyrene were identified as the most significant contaminants contributing to cancer risk, along with dioxins/furans. Cancer risk from benzo(a)pyrene was $4.2x10^{-4}$. Noncancer risks greater than the target hazard index of 1 were identified for naphthalene and dioxin/furans.

Site soils remain contaminated with NAPL. In some portions of the FPA, NAPL blebs can be seen on the surface. Other than a 1-acre area in the middle of the FPA where the pilot study was completed in 2003, no remedial actions have been implemented to remove or treat contaminated soils. Therefore, COC concentrations in much of the upland soil and the associated risks are not expected to have changed appreciably since the 1997 risk assessment.

2.7.2 Human Health Risk from Exposure to Groundwater

As explained in Section 6, upper aquifer groundwater within the FPA is considered nonpotable, so exposure to contaminated groundwater via ingestion is unlikely. The more likely exposure pathway to humans and aquatic organisms would be NAPL and groundwater seeps onto the OU1 intertidal beaches adjacent to the FPA through perimeter sheet pile wall leaks. Structural failure of the perimeter sheet pile wall below the mudline would result in the release of NAPL and contaminated groundwater (if the hydraulic containment system was off) to the beaches, exposing both beach users and marine organisms. Contaminated soil from the FPA could slough onto the beach if there was structural failure of the sheet pile wall above the mudline. The May 2018 Beaches and Perimeter Wall RODA included replacement of the perimeter sheet pile wall due to significant corrosion observed above the mudline. The new wall will drastically reduce the potential for failure, thus lowering the risk of exposure to contaminated soil, groundwater and NAPL on the beaches.

Groundwater south (and upgradient) and west of OU4 is used as a drinking water source. The hydraulic connectivity of off-Site drinking water wells with the Site's upper and lower aquifers has not been determined. However, to date, there have been no contaminant impacts to nearby drinking water wells. Contaminant concentrations in monitoring wells located between the contaminated groundwater plume and nearby drinking water wells have remained below groundwater CULs except for lower aquifer well PZ-11 where the PAH constituents acenaphthene, fluorene, and naphthalene have been detected at concentrations above their CULs. During the May 2018 annual monitoring event, acenaphthene was detected at a concentration of 23 µg/L, fluorene at 10 µg/L, and naphthalene at 350 µg/L.

2.7.3 Ecological Risks

The 1997 Ecological Risk Assessment evaluated risks to potential upland receptors including crop plants (oats, barley or lettuce), earthworms, deer mice, and American robins. The assessment was limited to sampling stations south of the FPA that did not have exceedances of a human health excess cancer risk of 10^{-5}. Other portions of the soil OU were not evaluated because near-surface and subsurface soils were slated for remediation to address human health risks. Areas represented by samples with a hazard quotient of greater than 1 in the Ecological Risk Assessment generally corresponded to discrete areas south of the FPA and the log storage/log peeler area. These same areas were identified in the human health risk assessment as exceeding the 10^{-5} cancer risk for humans. As described in Section 2.2, contaminated soils outside the FPA including soils in the log storage/log peeler area and around well CW01 have already been remediated.

2.7.4 Basis for Action

The response action in this RODA is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. It is estimated that more than 650,000 gallons of NAPL remain in the soil and groundwater OU2/4. The NAPL is highly mobile, and should the current containment remedy fail, the risks to Eagle Harbor and Puget Sound would be significant. The primary basis for taking action in the upper aquifer is to protect Eagle Harbor,

Puget Sound, and potential drinking water resources in the lower aquifer by minimizing the further spread of NAPL, dissolved PAHs, and PCP. Additional cleanup actions will also address the excess human cancer risk posed by surface and near-surface soil contamination in the FPA.

2.8 Remedial Action Objectives and Cleanup Levels

In accordance with the NCP, EPA developed Remedial Action Objectives (RAOs) to describe what the proposed cleanup is expected to accomplish to protect human health and the environment. RAOs help focus the development and evaluation of remedial alternatives and form the basis for establishing CULs.

2.8.1 Remedial Action Objectives

The four new RAOs for upland soil and groundwater are listed below; these RAOs replace the RAOs established in the 2000 ROD. RAOs are also presented in Table 2-3 along with the 2000 RAOs and the basis for any changes:

- RAO 1—Reduce human health risks associated with direct contact, ingestion, or inhalation of contaminated soil to levels that are protective of outdoor recreational use.
- RAO 2—Prevent human exposure to contaminated upper aquifer groundwater.
- RAO 3—Reduce risks associated with discharge of contaminated upper aquifer groundwater to Eagle Harbor and Puget Sound to levels that protect aquatic life and human consumption of resident fish and shellfish.
- RAO 4—Prevent further degradation of the lower aquifer and prevent exposure to lower aquifer groundwater that would result in unacceptable risk to human health.

2.8.2 Cleanup Levels

This section describes CULs for upland soils and groundwater. CULs are contaminant concentrations that will be used to measure the success of the Selected Remedy in meeting the RAOs. CULs must comply with applicable or relevant and appropriate requirements (ARARs) and result in residual risk levels that fully satisfy CERCLA requirements for the protection of human health and the environment. ARARs are legally applicable or relevant and appropriate substantive (as opposed to administrative) standards, requirements, criteria, or limitations under any federal environmental law, or promulgated under any state environmental or facility siting law that is more stringent than federal law. Key ARARs relevant to the selection of CULs are discussed in this section. ARARs are discussed further in Section 10.1.

2.8.2.1 Cleanup Levels for Soils (Remedial Action Objective 1)

The most significant ARARs for developing CULs for RAO 1 are the Washington Model Toxics Control Act (MTCA) rules for determining soil CULs, found in Washington Administrative Code (WAC), Section 173-340-740. The 2000 ROD established the cleanup area, called the “soil operable unit” based on exceedances of the soil CULs in that ROD. This RODA does not modify the delineation of the soil OU, but it does update the CULs established in Table 14 of the 2000 ROD. The new soil CULs (Table 2-4) were calculated using current information on the toxicity of PAHs. Naphthalene is now considered a carcinogen; the new CUL for naphthalene is lower than the CUL in the 2000 ROD. The cancer slope factor for benzo(a)pyrene was updated in 2017, resulting in higher cleanup numbers for benzo(a)pyrene and several other carcinogenic PAHs. The updated numbers meet the substantive MTCA requirement that CULs result in no adverse effects to ecological receptors or acute or chronic noncarcinogenic toxic effects on human health using a hazard quotient of 1 and an estimated excess cancer risk less than or equal to 1×10^{-6}, adjusted downward to take into account multiple hazardous substances and/or exposures so that the total excess cancer risk does not exceed 1×10^{-5}. The surface of the cap will be constructed using clean materials with COC concentrations below the soil CULs in Table 2-4.

Table 2-3. Remedial Action Objectives

Exposure Scenario	RAOs in 2000 ROD[a]	New RAOs Established in this RODA	Reason and/or Basis for Changing the RAO
Human exposure to surface and shallow subsurface soils	Prevent human exposure through direct contact (ingestion, inhalation, or dermal contact) with contaminated soil.	RAO 1: Reduce human health risks associated with direct contact, ingestion, or inhalation of contaminated soils to levels that are protective of outdoor recreational use.	Future land use was unknown at the time of the 2000 ROD.[a] Now that future use has been determined to be a park, the RAO is more specific.
Soil runoff to Eagle Harbor	Prevent stormwater containing contaminated soil from reaching Eagle Harbor.	No RAO established for soil runoff.	In the 2000 ROD,[a] the perimeter wall was envisioned as a temporary structure needed to prevent releases of contaminated groundwater during steam injection and groundwater extraction. The perimeter wall could be removed once groundwater cleanup objectives were attained. The perimeter wall is now recognized as a permanent structural feature of the Site, needed to support future use as a park. The perimeter wall surrounds contaminated soils remaining on Site on three sides, effectively preventing erosion into Eagle Harbor.
Human use of and exposure to upper aquifer groundwater	Protect humans from exposure to groundwater containing contaminant concentrations above MCLs.	RAO 2: Prevent human exposure to contaminated upper aquifer groundwater.	The RAO in the 2000 ROD [a] addressed groundwater in both the upper and lower aquifers. This RODA addresses upper aquifer groundwater only, requiring a commensurate narrowing of the RAO. The final ROD for OU2/4 will address remedial action objectives and CUL for lower aquifer groundwater.
Discharge of NAPL from the upper aquifer to marine waters	Reduce NAPL source and quantity of NAPL leaving the upper aquifer beneath the FPA sufficiently to protect marine water quality, surface water, and sediments (for example, ensure the quantity of NAPL leaving the Site will not adversely affect marine aquatic life and sediments). Site-specific groundwater contaminant concentration limits will be met at the mudline.	No specific RAO for NAPL releases; for releases of contaminated groundwater, see RAO 3, below.	NAPL has been identified as principal threat waste and the Selected Remedy treats NAPL thereby preventing future discharges from the upper aquifer to Eagle Harbor or Puget Sound.
Discharge of water from the upper aquifer to marine waters	Ensure contaminant concentrations in the upper aquifer groundwater leaving the FPA will not adversely affect marine water quality and aquatic life in surface water and sediment.	RAO 3: Reduce risks associated with discharge of contaminated upper aquifer groundwater to Eagle Harbor and Puget Sound to levels that protect aquatic life and human consumption of resident fish and shellfish.	The new RAO is similar to the old one; both aim to protect human health and marine life. The new RAO addresses both risks to fish and shellfish and to risks to people eating fish and shellfish.

Exposure Scenario	RAOs in 2000 ROD[a]	New RAOs Established in this RODA	Reason and/or Basis for Changing the RAO
Human use of and exposure to lower aquifer groundwater	Protect the groundwater outside the FPA and in the lower aquifers, which are potential drinking water sources.	RAO 4: Prevent further degradation of the lower aquifer and prevent exposure to lower aquifer groundwater that would result in unacceptable risk to human health.	The updated language in Upland RAO 4 recognizes that a portion of the lower aquifer is already contaminated and seeks to prevent further degradation, rather than "protect" this resource. The new language also seeks to protect human health by preventing exposure to contaminated lower aquifer groundwater.

[a] EPA (2000a)

FPA former process area
MCL maximum contaminant level
NAPL nonaqueous-phase liquid
OU2/4 Operable Units 2 and 4
RAO remedial action objective
RODA Record of Decision Amendment

Table 2-4. Soil Cleanup Levels

Contaminant of Concern	2000 ROD Soil Cleanup Levels, mg/kg[a]	2016 Proposed Plan Preliminary Remediation Goals (mg/kg)[b]	Final Cleanup Levels (mg/kg)
Naphthalene	3,200	1,600 (nc)	3.8 (c)[c]
Acenaphthene	4,800	4,800 (nc)	4,800 (nc)[d]
Fluorene	3,200	3,200 (nc)	3,200 (nc)[d]
Anthracene	24,000	24,000 (nc)	24,000 (nc)[d]
Fluoranthene	3,200	3,200 (nc)	3,200 (nc)[d]
Pyrene	2,400	2,400 (nc)	2,400 (nc)[d]
cPAH Constituents for Compounds			
Benzo(a)anthracene	0.137	1.37 (c)	1.9 (c)[e]
Chrysene	0.137	137 (c)	19 (c)[e]
Benzo(b)fluoranthene	0.137	1.37 (c)	1.9 (c)[e]
Benzo(k)fluoranthene	0.137	137 (c)	1.9 (c)[e]
Benzo(a)pyrene	0.137	0.137 (c)	0.19 (c)[e]
Indeno(1,2,3 c,d)pyrene	0.137	1.37 (c)	1.9 (c)[e]
Dibenzo(a,h)anthracene	0.137	0.137 (c)	1.9 (c)[e]
Total cPAH (summed TEQ for 7 cPAHs listed above), adjusted based on potency relative to benzo(a)pyrene	ND	ND	0.19(c)[e]
Pentachlorophenol	8.33	2.50 (c)	2.5 (c)[f]
Dioxin (2,3,7,8-TCDD) TEQ[g]	0.000007	N/A	N/A
Dioxin (2,3,7,8-Tetrachlorodibenzo-p-dioxin)	N/A	0.0000013 (c)	0.000013 (c)[f]

[a] Table 14, EPA (2000)
[b] Table 7-1, EPA (2016)
[c] Final CULs for napthalene from EPA Regional Screening Levels Table (EPA, 2019).
[d] Final CULs for acenapthene, fluorene, anthracene, fluoranthene, and pyrene from MTCA CLARC Tables: Method B Noncancer Direct Contact (Ecology, 2015a).
[e] Final CULs for carcinogenic PAHs are MTCA Method B cancer direct contact values, revised in 2019 (Ecology, 2019) using EPA's updated cancer slope factor for benzo(a)pyrene (EPA, 2017).
[f] Final CUL for pentachlorophenol and dioxin from MTCA CLARC Tables: Method B cancer direct contact (Ecology, 2015a).
[g] Chlorinated dioxin/furan TEFs (expressed as 2,3,7,8-TCDD TEQ)

(c)	cancer
CLARC	Cleanup Levels and Risk Calculation
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CUL	cleanup level
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
mg/kg	milligrams per kilogram
MTCA	Model Toxics Control Act
ND	no data
N/A	not applicable/none specified
(nc)	noncancer
PAH	polycyclic aromatic hydrocarbons
ROD	Record of Decision
TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
TEF	toxicity equivalency factor
TEQ	toxic equivalency

The entire area of the FPA will be covered by the final site cap. Soils beneath the final site cap will be contained by a fully enclosing perimeter wall, preventing human or ecological exposure. This RODA does not establish cleanup levels for soil within this containment area.

2.8.2.2 Cleanup Levels for Groundwater (Remedial Action Objectives 2, 3, and 4)

Beneath the final site cap, upper aquifer groundwater within the FPA will be contained by the perimeter wall and a new southern groundwater "cutoff" wall described in Section 13.1. Because groundwater in this area is considered non-potable (as described in Section 6), drinking water standards are not applicable. This RODA does not establish cleanup levels for groundwater within this containment area.

Discharge criteria will be developed for any discharge of groundwater from the containment area to ensure compliance with the substantive requirements of Section 402 of the Clean Water Act and Washington Administrative Code 173-220-130. Discharging groundwater will be treated as necessary to meet the discharge limits. The discharge limits will be included in a future CERCLA decision document (e.g., an ESD or the final ROD for the Site).

This interim RODA does not include cleanup measures in the lower aquifer. The objective of preventing further degradation will be met if lower aquifer groundwater contaminated above MCLs does not spread to monitoring wells between the FPA and nearby drinking water wells. Contamination of lower aquifer groundwater will be addressed in a future cleanup decision for OU2/4.

2.9 Description of Alternatives

As explained in Section 7.3, Basis for Action, EPA determined that additional cleanup actions are necessary to protect human health and the environment. This section presents and describes the remedial alternatives that were developed and evaluated.

EPA developed seven remedial alternatives and identified Alternative 7 as the preferred alternative in the Proposed Plan. EPA selected Modified Alternative 7 as the Selected Remedy after consideration of public comments on the Proposed Plan. The following subsections describe all the alternatives considered, including the Selected Remedy. More detailed explanations of the alternatives may be found in the 2015 FFS. The Selected Remedy is described in more detail in a supplement to the FFS (CH2M, 2019). All areas, boundaries, and volumes presented in this section are based on data available at the time of the FFS and may be refined during remedial design.

Because many of the upland alternatives would require O&M beyond the commonly used assumption of 30 years, the cost analysis used in the FFS includes 100 years of O&M. A considerable amount of preparatory and general construction work will be required to implement the alternatives. Because they are included in many of the upland alternatives, these "common elements" are described first.

2.9.1 Common Elements

Following are remedial components that are common to the alternatives:

- **Demolition and debris removal (Alternatives 3 through 7) —** An estimated 8,000 cubic yards of concrete building foundations, buried utilities and debris, equipment left from the steam-enhanced extraction pilot study, and old facility bulkheads (both wood and rock) are buried within the FPA. These materials must be removed to allow for successful implementation of cleanup measures. In the FFS, EPA assumed the concrete would be crushed to allow recovery and recycling of reinforcing steel rebar, and that some of the concrete would be re-used on Site.
- **Stormwater infiltration trench (Alternatives 3 through 7) —** A stormwater infiltration trench would be needed to collect surface water, diverting it away from active work areas during remedial construction.

- **Final Site cap (Alternatives 2 through 7) —** Soils in the FPA would be capped to minimize surface water infiltration and prevent exposure to residual contaminants. The containment remedy in the 2000 ROD included a final Site cap, but the cap has not been constructed. In the FFS, EPA assumed the cap would include a 60-mil high-density polyethylene geomembrane overlain by 12 inches of drainage material, a cushion to provide drainage layer puncture protection, and 12 inches of topsoil. The final cap materials will be determined during the remedial design phase. The cap would cover the area inside the perimeter wall estimated at 8.1 acres.
- **New outfall pipe (Alternatives 2 through 7) —** Once the final Site cap is constructed, stormwater that previously infiltrated into the ground would have to be collected and discharged. This item includes a collection system and a new outfall pipe to convey stormwater from the surface of the cap to a discharge point in Eagle Harbor or Puget Sound.
- **Passive groundwater drainage with treatment (Alternatives 3 through 7) —** Under current conditions, upper aquifer water levels are controlled by operation of the hydraulic containment wells. When these wells are turned off, the water level will rise, potentially flooding portions of the FPA. Flooding would likely hinder future Site use. Rising groundwater levels would also increase hydrostatic pressure on the perimeter wall. The passive discharge/treatment system would consist of a series of drain systems that would maintain the upper aquifer groundwater level at an elevation that protects the final cap and promotes gravity drainage. Each drain system would include three components: a collection system, treatment media such as granular-activated carbon to remove dissolved-phase COCs, and a downward-sloping pipe to convey the treated water through the perimeter wall to discharge points below the surface of the beaches. Groundwater would drain from the FPA during low tides by gravity. Check valves in the pipes or similar measures would prevent seawater from flowing into the drains during high/incoming tides. O&M activities would include monitoring contaminant concentrations in discharging groundwater to ensure compliance with discharge limits and replacing spent treatment media, as needed, until the groundwater no longer requires treatment.
- **Groundwater monitoring (Alternatives 2 through 7) —** Groundwater elevations and contaminant concentrations in both the upper and lower aquifers would be monitored during and after construction.
- **ICs (Alternatives 2 through 7) —** ICs were included in the 2000 ROD but have not yet been established. Restrictive covenants consistent with the Uniform Environmental Covenants Act would be needed to: (1) protect the final Site cap from future construction actions that would expose workers or the public to contamination left below the cap or compromise the function of the cap, (2) prohibit the installation of groundwater wells in the upper aquifer within the perimeter wall, (3) prohibit the installation of groundwater wells in the lower aquifer in or near the contaminant plume, and (4) protect any habitat constructed or enhanced as compensatory mitigation for remedial construction impacts.

Table 2-5 shows which common elements are needed for each upland alternative. For cost estimating purposes, the first common element (Demolition and Debris Removal) was broken down into four separate items.

2.9.2 Remedial Alternatives

This section describes the remedial alternatives considered and presented in the Proposed Plan, and the modified version of Alternative 7, which is the Selected Remedy. Remedial alternative costs in this RODA differ from those presented in the Proposed Plan. In the Proposed Plan, alternatives to address upland soil and groundwater included two additional common elements – a new perimeter bulkhead wall and access road improvements. Because these items were included in the May 2018 RODA, they are excluded from the estimates below.

Table 2-5. Common Elements Included in Alternatives 2 through Modified 7

Common Element	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Modified Alt 7
Preconstruction activities	n/a	X	X	X	X	X	X	X
Demolition and debris removal	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
• Concrete demolition, decontamination, reuse	n/a	n/a	X	X	X	X	X	X
• Debris removal	n/a	n/a	X	X	X	X	X	X
• Other demolition	n/a	X	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	X	X	X	X	X	X
• Bulkhead debris removal	n/a	n/a	X	X	n/a	n/a	X	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	X
Stormwater infiltration trench	n/a	n/a	X	X	X	X	X	X
Upland cap	n/a	X	X	X	X	X	X	X
New outfall	n/a	X	X	X	X	X	X	X
Passive groundwater discharge/treatment	n/a	n/a	X	X	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	X	X	X	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	X
ICs	n/a	X	X	X	X	X	X	X
5-year reviews and ICs[a]	n/a	X	X	X	X	X	X	X

[a] 5-year reviews and ICs are listed here for completeness. Costs are included in the annual/period costs for each remedial action alternative.

IC institutional control
n/a not applicable

2.9.2.1 Alternative 1 – No Further Action

Estimated Capital Costs: $0
Estimated Construction Timeframe: 0 years
Estimated O&M Costs: $0
Estimated Time to Achieve RAOs: Not applicable
Total Estimated Present Value: $0

As required under the NCP, a "no action" alternative is evaluated to compare cleanup alternatives with baseline conditions. Under Alternative 1, no further action would be taken for the Wyckoff Soil and Groundwater OUs. The existing groundwater extraction wells and groundwater treatment plant would be shut down, and this equipment would not be decommissioned. Once constructed, the new concrete perimeter wall, selected in the May 2018 RODA for OU1 and OU2/4, would remain in place and would continue to prevent erosion and transport of contaminated soils into Eagle Harbor and Puget Sound. Groundwater elevations inside the wall would vary seasonally, with the lowest elevations occurring during dry summer months. During heavy winter rains, areas within the perimeter wall would likely be flooded with standing water, with LNAPL present at low points on the ground surface. High groundwater elevations in the upper aquifer would result in a net downward hydraulic gradient, resulting in increased contamination of the lower aquifer from the downward transport of dissolved contaminants and NAPL. Upland Alternative 1 is not considered protective and does not meet ARARs or achieve RAOs.

2.9.2.2 Alternative 2 – Continued Containment

Estimated Capital Costs: $11,500,000

Estimated Construction Timeframe: 2 years

Estimated O&M Costs: $7,600,000

Estimated Time to Achieve RAOs: 2 years, but would require more than 100 years of groundwater extraction and treatment to maintain RAOs

Total Estimated Present Value: $19,100,000

This alternative would include only minor changes to the 2000 ROD. Under this alternative, the final Site cap specified in the 2000 ROD would be completed, and the remedy would be operated for 100 years. In addition to the identified common elements, Alternative 2 would include the following:

- Upgrading the groundwater extraction network by installing four new wells and rehabilitating the existing nine extraction wells.
- Upgrades to the existing groundwater treatment plant (GWTP) electrical and instrumentation and control systems. The upgrades will improve remote/off-Site control of wellfield and GWTP operations and increase system reliability.
- Periodic sampling and analysis to: 1) confirm GWTP treatment effectiveness, assess the need for treatment media changeout, and ensure compliance with outfall discharge criteria; 2) assess COC concentration changes in Upper and Lower Aquifer groundwater; and 3) verify hydraulic containment of the dissolved-phase plume.
- Existing engineering access controls (GWTP and recovery well fencing and signage) would be maintained.
- ICs would be established to prevent unauthorized land and groundwater use and protect the integrity of the final Site cap.

Alternative 2 would remove approximately 30% of the NAPL in upper aquifer soils.

O&M would consist of continuous groundwater extraction and treatment for 100 years. The recovery wells and some GWTP mechanical equipment are assumed to require replacement approximately every 30 years. 100 years of O&M was included, to be consistent with the other alternatives. However, more than 100 years of operations would be required to meet RAOs.

This alternative would comply with action and location-specific ARARs and is expected to comply with chemical-specific ARARs for soil and passive groundwater discharges. Key ARARs include the Washington Model Toxics Control Act (MTCA) soil CULs for imported materials used to construct the cap, and treated water discharge limits, which were determined in the 2000 ROD pursuant to Section 402 of the Clean Water Act.

2.9.2.3 Alternative 3 – Excavation, Thermal Desorption, and In-Situ Chemical Oxidation

Contaminated soils in the FPA would be excavated, to depths as great as 55 feet. The excavated soils would be treated in a medium temperature thermal desorption (MTTD) unit to destroy the contaminants, then reburied within the excavation. Contaminated areas deeper than 55 feet would be treated by in-situ chemical oxidation (ISCO), such as permanganate or hydrogen peroxide. The excavation, MTTD, and ISCO treatment steps would be performed simultaneously. Enhanced aerobic biodegradation (EAB) would be implemented after the excavation, MTTD, and ISCO treatment steps.

Alternative 3 was eliminated in the screening phase of the FFS. During preliminary engineering, the degree of shoring and dewatering necessary to excavate upper aquifer soil to depths up to 55 feet bgs

was determined to not be technically practicable without incurring significant geotechnical risk. Additionally, due to these considerations, it was apparent that the cost of this alternative would be disproportionate to its long-term effectiveness.

Because Alternative 3 was eliminated early in the development of the FFS, ARAR compliance was not evaluated, the initial cost estimate was not completed, and Alternative 3 is not included in the detailed analysis of alternatives.

2.9.2.4 Alternative 4 – In-Situ Solidification/Stabilization

Estimated Capital Costs: $79,300,000

Estimated Construction Timeframe: 4 years active construction, followed by 8 years of passive groundwater treatment

Estimated O&M Costs: $1,500,000

Total Estimated Present Value: $80,800,000

Estimated Time to Achieve RAOs: 12 years

Under Alternative 4, approximately 325,000 cubic yards of NAPL-contaminated would be treated in situ by immobilizing the NAPL in a cement-type matrix. In addition to the identified common elements, this alternative included the following activities:

- A laboratory study to determine the best mix of reagents and the amount of reagent needed to meet Site-specific performance goals.
- Excavating the treatment area to a depth of approximately 7 feet to create room for the soil to swell when the reagents are added.
- Setting up a temporary reagent batch plant to combine the reagents into a slurry. Reagents would be delivered by truck.
- Mechanically mixing the reagents into the soils over most of the FPA using large augers that inject reagent slurry as they advance downward. Auger mix ISS would be performed using a crane mounted auger or hydraulic drill rig. This would create an array of overlapping, cement-like columns extending from the soil surface to the bottom of the treatment target zone.
- Delivering reagents into the deepest portions of the FPA using high pressure jet-grouting instead of large augers. Jet grouting would mix reagent and NAPL contaminated soil using high-pressure injection to fluidize the soil, creating overlapping columns similar to the auger mixed columns, but smaller in diameter.
- Mechanically mixing reagents into the stockpiled soils that were removed to create room for soil swell. Stockpiled and shallow surface soils would be mixed by an excavator, either in-situ or in a temporary treatment cell. Once treated, this material would be used for grading and contouring prior to installation of the final Site cap.
- Abandoning groundwater wells and demolishing the GWTP. Continued groundwater extraction and treatment would be needed during construction to manage groundwater levels in excavation areas and to monitor the impact of ISS operations. When they are no longer needed, groundwater extraction wells and monitoring wells in the ISS treatment area would be abandoned. When it is no longer needed, the GWTP would be demolished.

Alternative 4 would treat approximately 93% of NAPL contaminated soils in the upper aquifer.

O&M would consist of sampling to ensure the passive drains meet discharge criteria, passive groundwater treatment through filters in the drain systems until treatment is no longer needed, and

maintenance of the passive drains, with periodic replacement as needed. O&M would also include annual inspections/maintenance of the cap and stormwater drainage system, periodic monitoring to ensure the slurry cutoff wall remains effective in diverting clean groundwater around the FPA, and monitoring to ensure IC requirements are observed.

Alternative 4 would comply with action and location-specific ARARs and is expected to comply with chemical-specific ARARs. Key ARARs include Section 402 of the Clean Water Act, which would govern discharge limits for groundwater discharged through the passive groundwater drains (which are a common element). MTCA-compliant soil CULs for COCs (Table 2-4) would be met in the imported materials used to construct the final Site cap.

2.9.2.5 Alternative 5 – Thermal-Enhanced Extraction and In-Situ Solidification/Stabilization

Estimated Capital Costs: $86,700,000

Estimated Construction Timeframe: 10 years of active construction, followed by 17 years of passive groundwater treatment

Estimated O&M Costs: $1,300,000

Total Estimated Present Value: $88,000,000

Estimated Time to Achieve RAOs: 27 years

Alternative 5 would remove and treat NAPL in upper aquifer soil using a combination of NAPL recovery, steam injection and extraction with on-Site thermal destruction, ISS and EAB. In addition to the identified common elements, Alternative 5 includes the following components:

- ISS of the North Deep (DNAPL) zone. 29,400 cubic yards (CY) of contaminated material would be treated to depths up to 76 feet using the jet-grout mixing as described for Alternative 4.
- Enhanced NAPL recovery using an array of multipurpose wells. NAPL and groundwater would be extracted using an array of 147 extraction wells. NAPL recovery would operate for approximately 3 years. Removing mobile NAPL would increase the effectiveness of steam injection and extraction and shorten the duration period, thereby reducing costs.
- On-Site groundwater treatment with off-Site waste incineration. During NAPL recovery, extracted NAPL and groundwater would be pumped to the GWTP where the NAPL would be separated in a newly installed oil-water separator and the groundwater treated in the existing GWTP. Recovered NAPL would be transported off Site and destroyed in a hazardous waste incinerator.
- Steam injection and extraction. Approximately 248,000 CY of contaminated soils would be treated in the central, north, and east portions of the FPA, to depths of up to 55 feet. A vapor barrier would be constructed over the treatment area, and then steam would be injected into an array of wells to recover to recover additional NAPL. Steam, NAPL, and vapors would be extracted through recovery wells, and additional vapors would be extracted through a network of perforated pipes under the vapor barrier.
- Recovered product handling. All extracted liquids and vapors would be routed through a direct contact condenser specifically designed to remove NAPL sludge, solid-phase PAH, and any extracted solids. NAPL sludge and solid-phase PAHs would be sent to an off-Site hazardous waste incinerator. Vapors would be treated in an on-Site thermal oxidizer.
- EAB polishing of thermally treated zones. After thermal treatment is completed, EAB would be implemented in each zone as a polishing step to promote aerobic biodegradation of residual NAPL and dissolved/sorbed-phase COCs. Residual heat from the thermal treatment step would accelerate aerobic biodegradation promoting a higher degree of treatment. EAB would also be used to treat

approximately 327,000 CY of low-level NAPL-contaminated material present at depths from 10 to 45 bgs in outer, periphery areas of the FPA.

- Well abandonment and demolishing the GWTP. When no longer needed, groundwater extraction wells and monitoring wells would be abandoned and the GWTP demolished.

Alternative 5 would remove or treat approximately 84 percent of the NAPL. The remaining 16 percent would be treated through passive groundwater treatment and natural attenuation processes.

O&M would consist of sampling to ensure the passive drain discharge meets the discharge criteria, changeout of spent treatment filters until treatment is no longer needed, and maintenance of the outlet to allow for gravity discharge. O&M would also include annual inspections/maintenance of the cap and stormwater drainage system, and monitoring to ensure IC requirements are observed.

Alternative 5 would comply with action and location-specific ARARs and is expected to comply with chemical-specific ARARs. Key ARARs include MTCA emission standards (WAC 173-400-075 "Emission Standards for Sources Emitting Hazardous Air Pollutants") and Section 402 of the Clean Water Act, which would govern discharge limits for groundwater released through the passive drains. MTCA soil CULs would be met in the imported materials used to construct the final Site cap.

2.9.2.6 Alternative 6 – Excavation, Thermal Desorption, and Thermal-Enhanced Extraction

Estimated Capital Costs: $133,600,000

Estimated Construction Timeframe: 12 years of active construction, followed by 15 years of passive groundwater treatment

Estimated O&M Costs: $1,400,000

Total Estimated Present Value: $135,000,000

Estimated Time to Achieve RAOs: 27 years

Alternative 6 is a hybrid of Alternatives 3 and 5. It would use excavation and thermal desorption in the center of the FPA but only to a depth of 20 feet, thus avoiding the geotechnical problems of Alternative 3. NAPL deeper than 20 feet would be treated with thermal-enhanced extraction. EAB would be used to treat lower levels of contamination in the periphery of the upland and as a polishing step following thermal-enhanced extraction.

In addition to the identified common elements, Alternative 6 would include:

- Excavation of approximately 81,300 CY of NAPL source material present within the top 20 feet in the central "core" area of the FPA. To facilitate dewatering and soil excavations, the target treatment area would be divided into approximately nine (9) cells divided by sheet pile walls. The sheet pile walls would extend from the ground surface to the aquitard. Within each cell, dewatering wells would be installed to lower the water table below a depth of 20 feet.
- Thermal desorption of excavated soils. Excavated soils would be hauled to an on-Site soil blending and handling building, where they would be screened as needed to remove rocks and debris, then blended to ensure a consistent feedstock for the thermal desorption unit. The soils would then be treated in an on-Site thermal desorption unit. Vapors from the unit would be further treated in a thermal oxidation unit. Once cooled, the treated soils would be used to backfill the excavated areas. Prior to backfilling, a geosynthetic clay liner would be placed on the bottom of the excavation cells to create a vapor barrier to support subsequent thermal treatment operations.
- Thermal enhanced extraction of soils deeper than 20 feet bgs. Deeper portions of the central "core" area, between depths of 20 feet and the top of the aquitard, and eastern and northern portions of the FPA, including deep areas with DNAPL would be treated using steam injection and extraction, as

described for Alternative 5. Following completion of thermal treatment, EAB would be implemented as a polishing step to promote aerobic biodegradation of residual NAPL and dissolved/sorbed-phase COCs. Residual heat from the thermal treatment step would accelerate aerobic biodegradation promoting a higher degree of treatment.

- EAB in the outer/periphery areas of the FPA, where NAPL concentrations are lower.
- Well abandonment and demolishing the GWTP. When no longer needed, groundwater extraction wells and monitoring wells would be abandoned and the GWTP demolished.

Alternative 6 would treat approximately 85 percent of the NAPL present in the FPA using the primary technologies of excavation, thermal desorption, thermal enhanced extraction and EAB. The remaining 15 percent would be addressed through passive groundwater treatment and natural attenuation.

O&M would consist of sampling to ensure the passive drain discharge meets the discharge criteria, changeout of spent treatment filters until treatment is no longer needed, and maintenance of the outlet to allow for gravity discharge. O&M would also include annual inspections/maintenance of the cap and stormwater drainage system and monitoring to ensure IC requirements are observed.

This alternative would comply with action and location-specific ARARs and is expected to comply with chemical-specific ARARs. Key ARARs include MTCA emission standards (WAC 173-400-075 “Emission Standards for Sources Emitting Hazardous Air Pollutants”) and Section 402 of the Clean Water Act, which would govern discharge limits for groundwater released through the passive drains. MTCA soil CULs would be met in the imported materials used to construct the final Site cap.

2.9.2.7 Alternative 7 – In-Situ Solidification/Stabilization of Core Area and Thermal-Enhanced Recovery

Alternative 7 was identified as the preferred alternative in the Proposed Plan. This alternative employed an adaptive management or iterative approach that provided the opportunity to respond to new information and changing Site conditions observed over the remedy implementation life-cycle. The alternative included two distinct phases, separated by a 5-year period of monitoring. Phase 1 monitoring results would determine whether Phase 2 actions are needed and if so, where.

Phase 1 Only

Estimate Capital Costs: $51,100,000

Estimated O&M Costs: $500,000

Total Estimated Present Value: $52,600,000

Estimated Construction Timeframe: 10 years of active construction, followed by up to 5 years of monitoring with continued groundwater extraction and treatment, then 16 years of passive groundwater treatment

Estimated Time to Achieve RAOs: 31 years

Phase 1 and Phase 2

Estimate Capital Costs: $61,000,000

Estimated O&M Costs: $900,000

Total Estimated Present Value: $61,900,000

Estimated Construction Timeframe: 13 years of active construction spread over 18 years (with a “pause” for monitoring after year 10), followed by 16 years of passive groundwater treatment

Estimated Time to Achieve RAOs: 34 years

Phase 1 would consist of three treatment technologies:

- ISS would be used to treat approximately 202,000 cubic yards of soil. The treatment area would be smaller than in Alternative 4, but it would encompass the most heavily contaminated areas in the center of the FPA.
- NAPL recovery (using new extraction wells but no steam or other heat) would be used to address two areas outside the ISS treatment footprint, where the thickness of the NAPL indicates it would be amenable to recovery.
- EAB would be used to treat contamination along the inside of the perimeter sheet pile wall, reducing the need for treatment in the passive groundwater drainage system.

Post Phase 1 monitoring would involve the following activities:

- Monitoring groundwater levels, NAPL presence/absence and thickness in wells outside the ISS treatment area and dissolved-phase contaminant concentrations. Monitoring results would be used to determine whether Phase 2 actions are needed and if so, where.
- Conditions that would trigger Phase 2 actions include the continued presence of mobile NAPL in and around the passive drainage collection system and dissolved-phase contaminant concentrations that are too high to cost-effectively treat.

Phase 2 would be implemented in the areas defined by post Phase 1 monitoring and would include:

- Thermal-enhanced NAPL recovery. This technology would require less heat and energy than the steam-enhanced extraction technology of Alternatives 5 and 6. The steam injected in the ground would not be hot enough to cause the contaminants to partition into the vapor phase. This lower energy “wet steam” would increase NAPL mobility, allowing for a greater recovery rate.
- Based on the efficacy of Phase 1 actions, and the extent of contamination remaining after Phase 1, Phase 2 could be modified to include other technologies such as additional ISS using auger-mixing and/or jet-grouting as needed, or ISCO. The decision to use any of these additional technologies in Phase 2 would be documented in a future CERCLA decision document.
- Well abandonment and demolishing the GWTP. When no longer needed, groundwater extraction wells and monitoring wells would be abandoned and the GWTP demolished.

The construction schedule would depend on the success of Phase 1 actions.

- If Phase 1 actions are sufficient and Phase 2 is not needed, active construction would take 10 years.
- If Phase 2 is needed, an additional 3 years of construction would be needed.

Alternative 7 would treat approximately 65 percent of the NAPL in upland aquifer soils using ISS and recover approximately 20 percent of the NAPL using thermal enhanced recovery.

O&M would consist of sampling to ensure the passive drain discharge meets the discharge criteria, changeout of spent treatment filters until treatment is no longer needed, and maintenance of the outlet to allow for gravity discharge. O&M would also include annual inspections/maintenance of the cap and stormwater drainage system and monitoring to ensure IC requirements are observed.

Alternative 7 would comply with action and location-specific ARARs and is expected to comply with chemical-specific ARARs. Key ARARs include Section 402 of the Clean Water Act, which would govern discharge limits for groundwater allowed to drain through the passive groundwater drains. MTCA soil CULs would be met in the imported materials used to construct the final Site cap.

2.9.2.8 **Modified Alternative 7 –** In Situ Solidification / Stabilization with Groundwater Cutoff Wall

A modified version of Alternative 7 was developed in response to public comments on the Proposed Plan. This alternative, which is the Selected Remedy, combines elements of Alternative 7 and Alternative 4. Like Alternative 7, the Selected Remedy includes two distinct phases, with monitoring after Phase 1 to inform the need for and extent of Phase 2 actions. The estimates of areas, volumes, time to reach cleanup objectives, and cost for the Selected Remedy are based on RI/FS data, an addendum to the FFS (CH2M, 2019), and other information included in the Administrative Record.

Phase 1 Only

Estimate Capital Costs: $56,800,000

Estimated O&M Costs: $500,000

Total Estimated Present Value: $57,300,000

Estimated Construction Timeframe: 6 years of active construction, followed by 2 years of monitoring with passive groundwater treatment

Estimated Time to Achieve RAOs: 8 years

Phase 1 and Phase 2

Estimate Capital Costs: $59,000,000

Estimated O&M Costs: $700,000

Total Estimated Present Value: $59,700,000

Estimated Construction Timeframe: 8 years of active construction spread over 10 years (with a “pause” for monitoring after year 6)

Estimated Time to Achieve RAOs: 10 to 12 years

Phase 1 includes the common elements described in Section 9.1, with one important modification: The passive drain system includes fewer drains than Alternative 7. Four drains are assumed instead of 10; the final number and alignment will be determined in design.

In addition to the common elements, Modified Alternative 7 includes:

- Installation of a groundwater cutoff wall along the southern boundary of the FPA. The cutoff wall will connect the ends of the current U-shaped perimeter wall, resulting in a fully encircling wall around the NAPL source area. By reducing upgradient groundwater inflow, the cutoff wall will reduce the number of passive drains needed to manage groundwater levels in the upper aquifer.
- ISS of approximately 236,000 CY (less than Alternative 4 and more than Alternative 7) of NAPL contaminated soil using a combination of auger mixing, jet grout injection, and excavator mixing techniques during Phase 1 construction.
- 2 years of groundwater monitoring following completion of Phase 1 ISS treatment to assess overall effectiveness and to determine the need for Phase 2 ISS treatment.

Phase 2 ISS

- Where needed, Phase 2 ISS – excavator mixing would be performed, as described for Phase 1. An estimated 31,000 CY of NAPL contaminated material would be treated during Phase 2. ISS would be used instead of the NAPL recovery and EAB technologies included in Phase 2 of Alternative 7 because ISS would be faster and ensure more complete treatment of target areas.

- Following ISS construction, groundwater conditions in the upper aquifer would be monitored. The FFS assumed a one year "shake down" period, in which groundwater concentrations are expected to stabilize. However, it may take longer – up to three years, to determine the collective impact of the remedial measures on the groundwater. The GWTP would be demolished when it is clear there is no longer a need for groundwater treatment.

Modified Alternative 7 will treat approximately 267,000 CY of NAPL contaminated material, assuming both Phase 1 and Phase 2 are needed.

O&M activities would consist of sampling to ensure the passive drains meet discharge criteria, passive groundwater treatment through filters until treatment is no longer needed, and maintenance of the passive drains with periodic replacement as needed. O&M would also include annual inspections/maintenance of the cap and stormwater drainage system and monitoring to ensure compliance with IC requirements.

Additional details about each of the key elements of Modified Alternative 7 are provided in Section 13.

Modified Alternative 7 would comply with action and location-specific ARARs and is expected to comply with chemical-specific ARARs. Key ARARs include Section 402 of the Clean Water Act, which would govern discharge limits for groundwater discharged through the passive drains. MTCA soil CULs would be met in the imported materials used to construct the final Site cap.

2.10 Summary of Comparative Analysis of Alternatives

EPA used the nine criteria required by CERCLA (EPA, 1988) and the NCP (40 CFR Part 300.430[e] [9] iii) to evaluate and select the remedy. This section discusses the relative performance of each alternative against the nine criteria, noting how the Selected Remedy compares to the other alternatives. The nine criteria are in three categories: threshold criteria, balancing criteria, and modifying criteria (see text box).

2.10.1 Threshold Criteria Evaluation

These criteria specify what an alternative must meet to be eligible for selection as a remedial action.

Note: What are the CERCLA Nine Criteria for evaluating remedies?

- Threshold Criteria
  - Overall protection of human health and the environment
  - Compliance with ARARs
- Balancing Criteria
  - Short-term effectiveness
  - Long-term effectiveness and permanence
  - Reduction of mobility, toxicity, or volume through treatment
  - Implementability
  - Cost
- Modifying Criteria
  - State acceptance
  - Community acceptance

2.10.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each

exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

All alternatives, except Alternative 1, would protect human health and the environment through varying combinations of treatment and containment of NAPL-contaminated material, by restricting land and groundwater use, and by preventing exposure to contamination with the final Site cap. Alternative 2 would protect human health and the environment by pumping contaminated groundwater from the upper aquifer to prevent it from moving down into the lower aquifer or into Eagle Harbor and Puget Sound. Alternatives 4 through 7 and the Selected Remedy would reduce NAPL mass and/or toxicity and mobility, which would in turn reduce COC concentrations in groundwater, ensuring the remedy remains protective in the future. By treating source material in the upper aquifer, Alternatives 4 through 7 and the Selected Remedy would also protect the lower aquifer from further degradation.

10.1.1.1 Reduce Human Health Risks Associated with Direct Contact, Ingestion, or Inhalation of Contaminated Soil to Levels that Allow Unrestricted Outdoor Recreational Use (RAO 1)

All alternatives, except Alternative 1, prevent exposure to contaminated soils with a final Site cap and ICs. As long as the cap remains intact and the ICs are in place and enforced, Alternative 2, and Alternatives 4 through 7 and the Selected Remedy would all meet RAO 1. Among the alternatives that include a final Site cap, Alternative 2 would do the poorest job of meeting this RAO in the long term, because it would leave contaminated soils and a large mass of mobile NAPL untreated below the cap.

10.1.1.2 Prevent Human Exposure to Contaminated Upper Aquifer Groundwater (RAO 2)

Alternative 1 does not prevent or restrict the use of upper aquifer groundwater and would not meet RAO 2. All the other alternatives would meet RAO 2 through ICs to prevent upper aquifer groundwater withdrawal and a final Site cap to prevent direct exposure.

10.1.1.3 Reduce Risks Associated with Discharge of Contaminated Upper Aquifer Groundwater to Eagle Harbor and Puget Sound to Levels that Protect Aquatic Life and Human Consumption of Resident Fish and Shellfish (RAO 3)

The new perimeter wall included in the May 2018 RODA will improve containment of contaminated groundwater and mobile NAPL by replacing the current aging metal sheet pile wall with a new wall. However, the new wall will not be protective without additional remedial actions to contain or treat mobile NAPL in the FPA. Alternative 1 (no action) would not meet RAO 3. If hydraulic containment operations stopped, groundwater elevations would rise inside the wall, allowing contaminated groundwater and mobile NAPL to flow around the ends of the perimeter wall. Alternative 2 would meet RAO 3 as long as the groundwater extraction system, which draws groundwater away from the edges of the FPA, continues. Alternatives 4 through 7 and the Selected Remedy would all meet RAO 3 by treating source material to remove contaminants or reduce contaminant mobility.

10.1.1.4 Prevent Further Degradation of the Lower Aquifer and Prevent Exposure to Lower Aquifer Groundwater that Would Result in Unacceptable Risk to Human Health (RAO 4)

Currently, groundwater in the upper aquifer is extracted at a rate that maintains an inward and upward hydraulic gradient. This minimizes contaminant transport from the upper aquifer to the lower aquifer. However, the upward hydraulic gradient does not stop the downward movement of DNAPL, which is denser than water and responds more to gravity than to the hydraulic gradient. DNAPL transport through the aquitard is a particular concern in the northern part of the FPA, where the aquitard contains lenses of coarser, more permeable materials. The success of the alternatives in meeting RAO 4 depends on the extent to which they treat or remove DNAPL, and the extent to which they treat or remove NAPL mass within upper aquifer soils.

Alternative 1 does not meet RAO 4. Alternative 1 would worsen conditions by increasing the rate of contaminant transport to the lower aquifer. If the groundwater extraction and treatment system

currently operating in the upper aquifer is turned off, the frequency and duration of the downward hydraulic gradient would increase, allowing transport of dissolved contaminants into the lower aquifer. The downward gradient would be greatest during the winter and spring months, when upper aquifer groundwater elevations are highest. Additionally, with no treatment to address NAPL, contamination of the lower aquifer would increase under Alternative 1.

Alternative 2 would meet RAO 4. Lower aquifer monitoring data from the past 24 years shows variability in contaminant concentrations but no overall decline or improvement. Continued hydraulic containment operations would maintain the status quo. However, of the active treatment alternatives, Alternative 2 would be least protective of the lower aquifer. It would not treat or remove DNAPL in the northern portion of the FPA. Currently, the groundwater extraction system removes less than 5,000 gallons of NAPL per year. This represents a small fraction of the estimated 650,000 gallons of NAPL that remain in the upper aquifer. Alternative 2 would use ICs to prevent exposure to lower aquifer groundwater.

Alternatives 4 through 7 and the Selected Remedy would all meet RAO 4 through treatment and/or removal of contaminants and ICs to prevent lower aquifer groundwater exposure.

Alternatives 4, 5, and the Selected Remedy all include jet grouting to treat DNAPL in the deepest portions of the FPA. Jet grouting is expected to reduce contaminant mobility by solidifying NAPL and soils in a low permeability soil/concrete mixture. Alternative 6 would not specifically target DNAPL in the FPA but would treat it along with shallower NAPL zones using steam-enhanced NAPL extraction. Alternative 7 would recover some DNAPL using new NAPL recovery wells. Of these treatment options, jet grouting is the most likely to be successful in preventing further DNAPL transport into the lower aquifer because it is a more effective treatment technology.

2.10.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate federal and state requirements*, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA Section 121(d)(4).*

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable.

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site such that their use is well-suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all the applicable or relevant and appropriate requirements of other federal and state environmental statutes or provides a basis for invoking a waiver.

A complete list of ARARs relevant to this RODA is provided in the following three tables:

- Table 2-6—Chemical-specific ARARs
- Table 2-7—Action-specific ARARs
- Table 2-8—Location-specific ARARs

Additional information regarding ARARs may be found in the 2000 ROD (EPA, 2000a).

For soil in OU2, the most significant ARARs are the MTCA soils cleanup standards and federal and state Clean Air Act requirements. For all the alternatives except Alternative 1, soil cleanup standards will be largely met by preventing direct contact with treated and untreated soil using the perimeter wall, the final Site cap, and ICs. Clean Air Act requirements would apply to all the active treatment alternatives. For Alternatives 4, 7, and the Selected Remedy, meeting Clean Air Act requirements would require monitoring the concentrations of volatile contaminants to ensure community and worker safety during debris removal, excavation, and ISS treatment activities; control of fugitive dust generated during concrete demolition, soil excavation and stockpiling; and control of fugitive dust from reagent batch plant operations. For Upland Alternatives 5 and 6, compliance with Clean Air Act requirements would require actions to recover and treat vapor phase contaminants generated during thermal enhanced extraction. Alternative 6 would add an additional component subject to Clean Air Act requirements: an on-Site kiln to treat excavated soils via MTTD. Gasses generated in the kiln would need to be treated in a thermal oxidation unit and in an acid scrubber to meet discharge limits.

For upper aquifer groundwater in OU4, the Clean Water Act including federal and state regulations governing the discharge of pollutants to marine waters are important ARARs. The Safe Drinking Water Act does not apply to upper aquifer groundwater within the FPA because it is considered nonpotable, as described in Section 6. To prevent flooding and reduce hydrostatic pressure on the perimeter wall, the elevation of upper aquifer groundwater inside the wall will need to be managed through drains that allow excess water to discharge to the adjacent beaches. Groundwater discharged to the beaches must meet Washington Water Quality Standards. Alternative 2 would not require perimeter drains, as the current groundwater extraction system can be operated to maintain the desired groundwater elevation and the extracted groundwater treated in the GWTP to meet the existing discharge limits. Alternatives 4, 5, 6, and 7 would all meet discharge requirements through varying combinations of contaminant removal, in-situ treatment, and treatment through activated carbon filters in the passive drain system. The Selected Remedy includes an additional feature – a cutoff wall along the southern edge of the FPA – that will divert groundwater away from contaminated areas. By reducing the amount of groundwater inflow into the FPA, the cutoff wall will decrease the volume of groundwater requiring passive treatment and discharge.

2.10.2 Balancing Criteria Evaluation

The following subsections present the comparative evaluation of the alternatives against the balancing criteria to identify the major trade-offs among alternatives.

Table 2-6. Chemical-Specific Applicable or Relevant and Appropriate Requirements

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
Surface Water			
WAC 173-201A-240(5) Water Quality Standards for Surface Waters of the State of Washington	Establishes chemical water quality standards for surface waters of the State of Washington for protection of aquatic life.	State standards that are more stringent than federal standards are **relevant and appropriate** as criterion to apply to point source discharges that may occur in implementing the remedy.	Point source discharges will occur to Eagle Harbor and Puget Sound from perimeter drains and a new stormwater outfall pipe.
WAC 173-340-720(2) Potable Groundwater Defined	Defines conditions that make use of groundwater as a drinking water source impracticable. Groundwater containing TDS at concentrations greater than 10,000 mg/L shall normally be considered to have fulfilled this requirement.	Definition of potable groundwater is **Applicable**. Upper Aquifer groundwater is classified as nonpotable because TDS are present at concentrations greater than 10,000 mg/L.	Groundwater in the upper aquifer does not have to be cleaned up to drinking water standards because it does not meet the state's definition of "potable."
Soil			
WAC 173-340-740(3) Method B soil cleanup levels for unrestricted land use WAC 173-340-740(5) and Adjustments to cleanup levels WAC 173-340-708(8)	Requires that soil CULs result in no significant adverse effect on the protection and propagation of terrestrial ecological receptors; will not cause contamination of groundwater and are estimated to result in no acute or chronic noncarcinogenic toxic effects on human health using a hazard quotient of 1 and an estimated excess cancer risk less than or equal to 1×10^{-6}. Soil CULs are adjusted downward to take into account multiple hazardous substances and/or exposures so that the hazard index does not exceed 1 and the total excess cancer risk does not exceed 1×10^{-5}.	Provisions for the protection of terrestrial ecological receptors and human health are **Applicable**, and MTCA methods for calculating risk estimates are **To Be Considered** criteria for developing soil CULs. Provisions for the protection of groundwater in the upper aquifer do not apply, because upper aquifer groundwater that is not discharged through the perimeter drains will be contained within the perimeter wall.	All surface soils with contaminant concentrations exceeding a hazard quotient of 1 or an estimated excess cancer risk of 1×10^{-6} for recreational use will be capped. These levels are also protective of terrestrial ecological receptors.
WAC 173-340-740(6)(f) Point of compliance	Establishes the point of compliance for the cleanup of contaminated soils. For containment remedies, a point of compliance of less than fifteen feet can be established if the selected remedy is protective, is permanent to the maximum extent practicable, includes ICs to prohibit actives that would compromise the containment system, and includes compliance monitoring.	MTCA requirements are **Applicable** for setting points of compliance for the upland cleanup.	The remedy is a containment remedy, and the point of compliance is the top of the final Site cap. Within and below the cap, human exposure will be prevented by the cap and through the use of ICs and compliance monitoring.

CUL cleanup level
IC institutional control
mg/L milligrams per liter
MTCA Model Toxics Control Act
TDS total dissolved solids
WAC Washington Administrative Code

Table 2-7. Action-Specific Applicable or Relevant and Appropriate Requirements

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
Surface Water			
Federal: Clean Water Act of 1972 (Public Law 107-303), as amended; 33 USC 1251 et seq. State: "Water Pollution Control" (RCW 90.48, as amended); "Water Quality Standards for Surface Waters of the State of Washington" (WAC 173 201A)			
Clean Water Act, Section 402, 33 USC 1342	Regulates discharges of pollutants from point sources to waters of the U.S., and requires compliance with the standards, limitations and regulations promulgated per Sections 301, 304, 306, 307, 308 of the CWA. CWA §301(b) requires all direct dischargers to meet technology-based requirements. These requirements include, for conventional pollutants, application of the best conventional pollutant control technology (BCT), and for toxic and nonconventional pollutants, the best available technology economically achievable (BAT). Where effluent guidelines for a specific type of discharge do not exist, BCT/BAT technology-based treatment requirements are determined on a case-by-case basis using best professional judgment (BPJ). Once the BPJ determination is made, the numerical effluent discharge limits are derived by applying the levels of performance of a treatment technology to the wastewater discharge.	These requirements are **Applicable** to any discharge of water to Eagle Harbor or Puget Sound. Federal regulations apply where the requirements are more stringent than state promulgated point discharge requirements.	Point source discharges will occur to Eagle Harbor and Puget Sound from perimeter drains and a new stormwater outfall pipe.
WAC 173-200, "National Pollutant Discharge Elimination System Permit Program"	Regulates discharges of pollutants and other wastes and materials from point sources to surface waters of Washington.	These requirements are **Applicable** to any discharge of pollutants or other wastes or materials from a point source to Eagle Harbor or Puget Sound where requirements are at least as stringent or more stringent than Federal regulations.	Applicable to the perimeter drains that will be used to maintain water levels within the perimeter wall and to the new stormwater outfall pipe that will convey surface water off the final Site cap.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
WAC 173-201A-510(3) (a), (b), and (c), "Nonpoint source and stormwater pollution"	Requires the use of best management practices to prevent water quality violations caused by stormwater	**Relevant and Appropriate** for managing stormwater generated outside of the perimeter barrier wall during construction.	The existing perimeter wall prevents the discharge of stormwater and surface water to Eagle Harbor, so activities conducted solely within the upland portion of the Site are unlikely to cause water quality violations. Any work outside the perimeter wall, such as material storage south of the perimeter wall or transport of soils or soil stabilization reagents outside the perimeter wall will comply with these standards.
Soil			
WAC 173-340-355, "Development of cleanup action alternatives that include remediation levels"	Requires that cleanup alternatives include concentrations of hazardous substances that must be attained by the cleanup action	State regulation **relevant and appropriate** to the selection of soil and groundwater CULs	The soil CULs in Table 4 comply with this requirement. However, there are no CULs established for upper aquifer groundwater within the FPA. This requirement will be met in a future CERCLA decision, in which discharge criteria for groundwater in the perimeter drains will be specified.
Solid Waste			
WAC 173-304-407, "General Closure Requirements", WAC 173-340-710(c), "Post-closure Requirements", and WAC-173-304 "Minimum Functional Standards for Solid Waste Handling"	Establish minimum solid waste closure requirements for solid waste landfills and caps over solid waste	These regulations are **Applicable** to the design and construction of the cap covering the FPA	The remedial design for ISS treatment and design and construction of the final Site cap meet these requirements.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
Air			
Federal: Clean Air Act/State: "Washington Clean Air Act" (Chapter 70.94 RCW, as amended); State: "General Regulations for Air Pollution Sources" (WAC 173 400); "Controls for New Sources of Toxic Air Pollutants" (WAC 173 460); Regional: Regulations I and III, Puget Sound Clean Air Agency			
Clean Air Act, 40 CFR Parts 50 and 52	Places restrictions on air emissions from stationary and mobile sources that creates threats to human health as defined in the regulations and which may be generated from equipment used to construct the remedy.	These regulations are **Relevant and Appropriate** to evaluating how emissions may be minimized or reduced during construction of the remedy, including soil excavation and handling activities and soil reagent blending and delivery.	Remedial actions will be designed and performed in compliance with the standards.
WAC 173-400-040 "General Standards for Maximum Emissions"	All sources and emission units are required to meet the general emission standards unless a specific source standard is available. General standards apply to visible emissions, fallout, fugitive emissions, odors, emissions detrimental to persons and property, sulfur dioxide, concealment and masking, and fugitive dust.	State regulations defining methods of control to be employed to minimize the release of contaminants associated with fugitive emissions are Applicable to remedial actions that may generate fugitive emissions, for example, if an on-Site batch plant is used to make up concrete for the slurry wall. Would also apply to earth-moving equipment, dust from vehicle traffic, and mobile-source exhaust.	Remedial actions that have the potential to release air emissions will meet standards.
WAC 173-400-075 "Emission Standards for Sources Emitting Hazardous Air Pollutants"	Establishes emission standards for hazardous air pollutants. Adopts, by reference, "National Emission Standards for Hazardous Air Pollutants" (NESHAP [40 CFR 61]) and appendices.	State regulations defining emission standards may be Applicable to remedial actions.	Remedial actions will be designed and performed in compliance with the standards.
Regulation I and Regulation III, Puget Sound Clean Air Agency, Washington Clean Air Act, 70.94 RCW	Regulation I establishes rules and standards that are generally applicable to the control and/or prevention of the emission of air contaminants from all sources within the jurisdiction of the Agency. Regulation III establishes standards to reduce the ambient concentrations of toxic air contaminants in the Puget Sound region and thereby prevent air pollution. The major requirements of this regulation are implementation of Best Available Control Technology for sources of toxic air pollutant emissions from new and existing sources.	Soil remedial actions, particularly ISS via bucket/excavator mixing, have the potential to emit emissions subject to these standards. The Acceptable Source Impact Levels (ASILs) are Relevant and Appropriate for use in the air monitoring program during construction.	Remedial actions will be designed and performed in compliance with the standards

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
Solid and Dangerous Waste			
State: Washington Hazardous Waste Management (RCW 70.105, as amended)/Washington Dangerous Waste Regulations (WAC 173-303)			
WAC 173-303-016 "Identifying Solid Waste"	Identifies those materials that are and are not solid wastes and identifies those materials that are and are not solid wastes when recycled.	Solid waste identification requirements are **Applicable** to solid wastes generated during remedial actions.	Standards will be met for remediation activities
WAC 173-303-070 "Designation of Dangerous Waste"	Establishes the requirements for determining if a solid waste is a dangerous waste (or an extremely hazardous waste), for making quantity determinations and for small quantity generators.	Dangerous waste characterization and determination is **Applicable** to wastes generated during remedial actions, such as contaminated soil or debris that will be disposed of off Site.	The Remedial Action Work Plan will include procedures for identifying, testing, and segregating dangerous waste.
WAC 173-303-140 "Land Disposal Restrictions"	Establishes land disposal restrictions, including waste and applicable treatment standards determinations, and storage and disposal prohibitions.	**Applicable** to management of dangerous waste generated during remedial action, including contaminated soil and debris. Not applicable to soil that will be contained inside the perimeter wall and below the final Site cap.	Contaminated soils or debris may need to be treated to meet LDRs prior to disposal in Washington (or another state).
WAC 173-303-170 "Requirements for Generators of Dangerous Waste"	Establishes the requirements for dangerous waste generators. "Requirements for Generators of Dangerous Waste" (WAC 173-303-170[3]) includes the substantive provisions of "Accumulating Dangerous Waste On Site" (WAC 173-303-200) by reference.	**Applicable** to remedial actions that may generate dangerous wastes.	Remediation wastes (for example, contaminated soil, contaminated personnel protective equipment, recovered NAPL) may be dangerous waste, and will be managed in accordance with these requirements.
WAC 173-303-200 "Accumulating Dangerous Waste On Site"	Establishes the requirements for accumulating wastes on Site. "Accumulating Dangerous Waste On Site" (WAC 173-303-200) includes certain substantive standards from "Use and Management of Containers (WAC 173-303-630) and "Tank Systems" (WAC 173-303-640) by reference.	State rules establishing requirements for accumulating dangerous waste on Site are **Applicable** for managing remediation wastes generated at the Site including contaminated debris, contaminated personal protective equipment, recovered NAPL and treatment chemicals.	Management of remediation wastes that are dangerous waste will comply with these requirements.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
WAC 173-303-630 “Use and Management of Containers”, WAC 173-303-280(6) “General Requirements”, and WAC 173-303-610(2), (4) and (5) “Closure”	Establishes requirements for management of dangerous waste in containers.	This standard is **Applicable** to remedial actions that involve management of dangerous waste in containers, (including recovered NAPL) that are subject to this standard.	Remedial actions that produce or manage containers of dangerous waste will be managed to meet standards.
WAC 173-303-64690 "Staging Piles"	Establishes the substantive requirements for temporary storage of solid, non-flowing remediation waste during remedial operations (incorporates by reference 40 CFR 264.554 requirements).	**Relevant and Appropriate** for management of remediation wastes including contaminated soil piles that may be generated and accumulated during construction.	Standards will be met for remediation waste.
WAC 173-303-280(6) “General requirements for dangerous waste management facilities: Requirements for cleanup only facilities”	Establishes requirements for the protection of public safety and worker safety at hazardous waste cleanup sites, including measures to prevent exposure by members of the general public, worker safety training, accident prevention, management of surface impoundments and waste piles, and construction quality assurance planning.	**Relevant and Appropriate** to construction activities associated with implementation of the remedial action.	Cleanup activities will comply with these standards.
State: Solid Waste Management - Reduction and Recycling (RCW 70.95, as amended); Solid Waste Handling Standards (WAC 173-350); Labeling and packaging requirements for transportation of hazardous materials (49 CFR 171)			
WAC 173-350-025 “Owner Responsibilities for Solid Waste", WAC 173-350-040 “Performance Standards”, WAC 173-350-300 "On-Site Storage, Collection and Transportation Standards", WAC 173-350-900 “Remedial Action”	Establishes minimum functional performance standards for the proper handling and disposal of solid waste, not otherwise excluded. Provides requirements for the proper handling of solid waste materials originating from residences, commercial, agricultural and industrial operations, and other sources, and identifies those functions necessary to ensure effective solid waste handling programs at both the state and local level.	Requirements are **Applicable** for covered solid waste generated during implementation of remedial actions.	Remedial actions that generate covered solid waste will meet standards.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
49 CFR § 171.1(b), Hazardous Material Regulations, pre-transportation functions	Any person who, under contract with a department or agency of the federal government, transports "in commerce," or causes to be transported or shipped, a hazardous material shall be subject to and must comply with all applicable provisions of the HMTA and HMR at 49 CFR 171 - 180 related to marking, labeling, placarding, packaging, emergency response, etc.	**Applicable** to transportation of hazardous materials such as NAPL recovered from the groundwater treatment system	Hazardous materials that will be transported off Site will be handled consistent with these requirements.
Asbestos			
Federal: Clean Air Act of 1990 and amendments; "National Emission Standard for Asbestos" (40 CFR 61, Subpart M)			
National Emission Standards for Asbestos, 40 CFR 61.150(a)(1)(i) - (v)	40 CFR 61.150(a) requires that there be no visible emissions to the outside air during collection, processing, packaging, or transporting of any asbestos-containing waste material. Subsections (a)(1)(i) and (ii) require that asbestos-containing waste material be adequately kept wet. Subsection (a)(1)(iii) requires that after wetting, asbestos-containing waste material be sealed in leak-tight containers while wet; or wrapped in leak-tight wrapping. Subsections (a)(1)(iv) and (v) specify container labeling requirements per Occupational Safety and Health Standards of the Department of Labor, Occupational Safety and Health Administration (OSHA) under 29 CFR 1910.1001(j)(4) or 1926.1101(k)(8).	**Applicable** as standards should asbestos be found during excavation and demolition of subsurface structures (for example, asbestos-wrapped piping or asbestos insulation)	If asbestos-containing materials are discovered during demolition or debris removal activities, they will be handled and disposed of off Site in a manner consistent with National Air Emission Standards.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
National Emission Standards for Asbestos, 40 CFR 61.150(b)(1) and (2) and (c)	40 CFR 61.150(b)(1) and (2) require that all asbestos-containing waste material be deposited as soon as is practical at a waste disposal Site operated in accordance with the provisions of § 61.154, or an EPA-approved Site that converts RACM and asbestos-containing waste material into non-asbestos (asbestos-free) material according to the provisions of § 61.155. Subsection (c) requires that vehicles used to transport asbestos-containing waste material be marked during the loading and unloading of waste with markings that conform to the requirements of §§ 61.149(d)(1) (i), (ii), and (iii).	**Applicable** to off-Site transportation, treatment and disposal of any asbestos-containing waste material encountered during excavation and demolition of subsurface structures.	Cleanup activities will comply with these standards.
State: "Water Well Construction" (RCW 18.104, as amended); "Minimum Standards for Construction and Maintenance of Wells" (WAC 173 160)			
WAC 173-160-161 "How Shall Each Water Well Be Planned and Constructed?"	Establishes requirements for construction of wells for treatment and groundwater monitoring. Identifies well planning and construction requirements. Water wells must not be a conduit for contamination and be constructed to yield the necessary quantity of water.	State requirements for well installation are Applicable standards. The selected remedy includes installation of new extraction and monitoring wells in both the Upper and Lower Aquifers.	The selected remedy will comply by constructing water wells that meet these standards.
WAC 173-160-181 "What Are the Requirements for Preserving the Natural Barriers to Ground Water Movement Between Aquifers?"	Establishes requirements for construction of wells for treatment and groundwater monitoring, including preservation of natural barriers to groundwater movement between aquifers.	State requirements for well installation are Applicable standards. The selected remedy includes installation of new extraction and monitoring wells in both the Upper and Lower Aquifers.	The selected remedy will comply by constructing water wells that meet these standards.
WAC 173-160-400 "What Are the Minimum Standards for Resource Protection Wells and Geotechnical Soil Borings?"	Identifies the minimum standards for resource protection wells and geotechnical soil borings.	State requirements for well installation and soil borings are Applicable standards. The selected remedy includes installation of new extraction and monitoring wells and soil borings in both the Upper and Lower Aquifers.	The selected remedy will comply by conducting soil borings and constructing water wells that meet these standards.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
WAC 173-160-420 “What Are the General Construction Requirements for Resource Protection Wells?”	Identifies the general construction requirements for resource protection wells.	State requirements for well installation are Applicable standards. The selected remedy includes installation of new extraction and monitoring wells in both the Upper and Lower Aquifers.	The selected remedy will comply by constructing water wells that meet these standards.
WAC 173 160 430 "What Are the Minimum Casing Standards?”	Identifies the minimum casing standards for groundwater protection wells.	State requirements for well installation are Applicable standards. The selected remedy includes installation of new extraction and monitoring wells in both the Upper and Lower Aquifers.	The selected remedy will comply by constructing water wells that meet these standards.
WAC 173 160 440 “What Are the Equipment Cleaning Standards?”	Applies to wells for treatment and groundwater monitoring and identifies the equipment cleaning standards for construction and maintenance of wells	State requirements for well installation are Applicable standards. The selected remedy includes installation of new extraction and monitoring wells in both the Upper and Lower Aquifers.	The selected remedy will comply by constructing water wells that meet these standards.
WAC 173 160 450 “What Are the Well Sealing Requirements?”	Applies to wells for treatment and groundwater monitoring and identifies the well sealing requirements for resource protection wells.	State requirements for well installation are Applicable standards. The selected remedy includes installation of new extraction and monitoring wells in both the Upper and Lower Aquifers.	The selected remedy will comply by constructing water wells that meet these standards.
WAC 173 160 460 “What Is the Decommissioning Process for Resource Protection Wells?”	Identifies the decommissioning process for resource protection wells.	State requirements for well decommissioning are Applicable standards. The selected remedy includes closure and removal of some of the existing extraction and monitoring wells in the ISS treatment area.	The selected remedy will comply by decommissioning water wells in a manner consistent with these standards.

Table 2-8. Location-Specific Applicable or Relevant and Appropriate Requirements

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
Archaeologically or Historically Sensitive Resources			
Federal: Native American Graves Protection and Reparation Act, 25 USC 3001-3013, 43 CFR 10	Requires Federal agencies and museums which have possession of or control over Native American cultural items (including human remains, associated and unassociated funerary items, sacred objects and objects of cultural patrimony) to compile an inventory of such items. Prescribes when such Federal agencies and museums must return Native American cultural items.	If Native American human remains or cultural items associated with human remains are present and discovered during remedial construction, this requirement is **Applicable**. Such a discovery at the Wyckoff Site is unlikely but possible, given the long use of Eagle Harbor by the Suquamish Tribe.	EPA will coordinate with the Suquamish Tribe during the construction planning phase to determine the level of training and archaeological oversight needed during different phases of construction. EPA and the Suquamish Tribe have a signed Memorandum of Understanding in place that describes procedures for notification and handling of any inadvertent discoveries.
Federal: National Historic Preservation Act. 16 USC 470 et seq. 36 CFR Part 800	Requires the identification of historic properties potentially affected by the agency undertaking, and assessment of the effects on the historic property and seek ways to avoid, minimize or mitigate such effects. Historic property is any district, Site, building, structure, archaeological Site, traditional cultural landscape, traditional cultural property, or object included in or eligible for the National Register of Historic Places, including artifacts, records, and material remains related to such a property.	**Applicable** if historic properties are potentially affected by remedial activities. (most of the former wood-treating facility has already been dismantled.)	EPA will consult with the Washington State Historic Preservation Officer, the State Department of Archaeology and Historic Preservation, and the Suquamish Tribe prior to the start of remedial construction and will work to avoid, minimize or mitigate the impacts of construction on any historic properties.
Federal: Archaeological and Historic Preservation Act. 16 USC 469a-1	Provides for the preservation of historical and archaeological data that may be irreparably lost as a result of a federally-approved project and mandates only preservation of the data.	**Applicable** if historical and archaeological data may be irreparably lost by implementation of the remedial activities.	EPA will consult with the Washington State Historic Preservation Officer, the State Department of Archaeology and Historic Preservation, and the Suquamish Tribe prior to the start of remedial construction and will preserve data as required, should there be any historical or archaeological features within the construction area.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
Sensitive Habitats and Protected Species			
Federal: Endangered Species Act. 16 USC 1536 (a)(2), Listing of endangered or threatened species per 50 CFR 17.11 and 17.12 or designation of critical habitat of such species listed in 50 CFR 17.95	Actions authorized, funded, or carried out by federal agencies may not jeopardize the continued existence of endangered or threatened species or result in the adverse modification of species' critical habitat. Agencies are to avoid jeopardy or take appropriate mitigation measures to avoid jeopardy.	**Applicable** to remedial actions that may impact endangered or threatened species or critical habitat that are present at the Site.	EPA will consult with the U.S. Fish and Wildlife Service regarding actions to be taken, their impacts on any listed species, and measures that will be taken to reduce, minimize, or avoid such impacts so as not to jeopardize the continued existence or adversely modify critical habitat. If take cannot be avoided, take permission from the Services will be obtained prior to construction.
Federal: Migratory Bird Treaty Act. 16 USC §703 50 CFR §10.12	Makes it unlawful to take any migratory bird. “Take” is defined as pursuing, hunting, wounding, killing, capturing, trapping and collecting.	**Applicable** - may require mitigation measures to deter nesting by migratory birds on, around, or within remedial action areas and methods to protect occupied bird nests.	EPA will use best management practices for observing and avoiding contact with migratory birds during construction of the remedy.
Federal: Bald and Golden Eagle Protection Act 16 USC § 668, 50 CFR Part 22	Protects bald and golden eagles from take, possession or transportation without a permit.	**Applicable** - may require mitigation for any disturbances to bald eagles.	If needed, remedial action work plans will include measures to minimize disturbances to bald eagles.
22State: Bald Eagle Protection Rules (WAC 232-12-292) Habitat Buffer Zone for Bald Eagles – Rules (RCW 77.12.655)	Protects eagle habitat to maintain eagle populations so the species are not classified as threatened, endangered, or sensitive in Washington State.	**Applicable** - may require mitigation for any adverse impacts to eagle habitat	If needed, remedial action work plans will include measures to protect eagle habitat.

2.10.2.1 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once CULs have been met. This criterion includes consideration of residual risk that will remain on-site following remediation and the adequacy and reliability of controls.

Of the active treatment options, Alternative 2 is the least permanent because it treats the smallest amount of NAPL. Currently, the groundwater extraction system removes less than 5,000 gallons of NAPL per year, a fraction of the approximately 650,000 gallons present in the upper aquifer. Long-term effectiveness would rely on continued operation of a groundwater extraction and treatment system. Alternatives 4 through 7 and the Selected Remedy would all reduce NAPL mass and/or toxicity and mobility in the upper aquifer. Alternatives 4, 7 and the Selected Remedy rely on ISS to reduce NAPL toxicity and mobility. This technology is expected to perform very well because it promotes direct contact between the reagent and NAPL and therefore, is less affected by soil heterogeneity. Additionally, the treated soils will be protected by the perimeter wall and soil cap. Because the soil/concrete matrix may degrade over several hundred years, this technology is considered slightly less permanent than the thermal enhanced extraction and thermal desorption technologies employed in Alternatives 5 and 6. Subsurface heterogeneity could limit thermal effectiveness in lower permeability soil lenses resulting in some NAPL being left behind under Alternatives 5 and 6.

All the alternatives would rely to some extent on long-term O&M to ensure the remedy remains effective in the future. Alternative 2 relies the most heavily on O&M, as it requires continuous groundwater extraction and treatment. The other alternatives all have similar O&M requirements, which include:

- Sampling to ensure the passive drains meet discharge criteria
- Changeout of spent treatment filters in the drain system until treatment is no longer needed
- Maintenance of the passive drain outlets to allow for gravity discharge
- Annual inspections of the cap and stormwater drain system, with maintenance as needed
- Monitoring to ensure IC requirements are observed

2.10.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Of the active treatment options, Alternative 2 does the poorest job of reducing NAPL toxicity, mobility, or volume in upper aquifer soil and groundwater. The extraction system in Alternative 2 was designed to maintain an inward and upward gradient in the upper aquifer, thus mitigating the migration of dissolved phase contamination to the lower aquifer. It was not designed to remove NAPL. The system currently removes about 5,000 gallons of NAPL per year, a minor amount compared to the estimated 650,000 gallons remaining. Alternative 2 includes the installation of four new extraction wells to increase the rate of NAPL recovery but would still require more than 100 years of continued operations.

Alternatives 4 and 7, and the Selected Alternative would reduce contaminant toxicity and mobility by binding Site contaminants, including NAPL, within a cement-based solid. ISS would not remove or destroy the COCs present in the NAPL, but it would immobilize them, preventing further movement and greatly lowering dissolved phase contaminant concentrations in upper aquifer groundwater. Alternative 5 would treat the deepest areas of contamination with ISS and use steam-enhanced extraction in other portions of the upper aquifer. Steam enhanced extraction would greatly reduce the mass of NAPL and COCs by removing them from upper aquifer soil and groundwater. Alternative 5 would also employ EAB as a polishing step to reduce dissolved phase COC concentrations. Alternative 6 would be the most effective in reducing the volume of contamination. Through MTTD, Alternative 6 would remove much of

the NAPL and COC mass from the top 20 feet of soil within the defined treatment area. Deeper areas of contamination would be treated as in Alternative 5, with steam-enhanced extraction. Alternative 7 is a hybrid alternative that would treat the most highly contaminated soils with ISS, while relying on less aggressive technologies to address areas with lower contaminant concentrations. The Selected Remedy combines features of Alternative 4 and Alternative 7, relying on ISS as the primary NAPL treatment technology, while retaining the phased implementation approach of Alternative 7.

2.10.2.3 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to the community, workers, and the environment during construction and operation of the remedy until CULs are achieved.

All the active treatment alternatives include a Site-wide cap, which would be protective as soon as construction is complete. Alternative 2 would take the shortest amount of time to build, followed by Alternative 4 and then by the Selected Remedy. Alternatives 5, 6, and 7, would all take considerably longer to implement because they rely on biodegradation to treat contamination. Injecting air would increase biological activity and the rate of PAH degradation, but the process would still be much slower than more active treatment measures.

Alternative 2 would be least disruptive to the community, with relatively little truck traffic, no significant noise, and little generation of odors. The most disruptive portion of the cleanup would Site grading and installation of the final Site cap. Alternative 2 would pose the least risk to cleanup construction workers.

The remaining alternatives would all be more difficult to implement, with each alterative posing different challenges.

- Truck Traffic. Alternatives 4, 7, and the Selected Remedy would all require large quantities of ISS reagent to be delivered to the Site, significantly increasing truck traffic on local roads. Alternative 5 would require far fewer truck trips to deliver reagent because only a small area of DNAPL contamination would be treated using ISS jet-grouting. Alternative 6 would not require reagent delivery. All the alternatives would require some oversized equipment including cranes, excavators, drill rigs, an ISS auger mixing rig, or a thermal desorption unit. Some of these items could be brought to the Site by barge.
- Noise. All the alternatives would create noise (engine noise, backup alarms) from conventional construction methods to remove debris and install other common elements including the stormwater infiltration trench and final Site cap. Among Alternatives 4 through 7 and the Selected Remedy, Alternative 5 would generate the least amount of noise because the primary remedial technologies require less soil excavation and handling. Alternative 6 would generate the most noise of all the alternatives, as soils are screened to remove debris and then processed in the thermal desorption unit. Thermal desorption operations would be very noisy, as smaller rocks that pass through the debris screens would repeatedly contact the sides of the rotating kiln during treatment. To reduce this impact, the equipment would be housed in an enclosed building.
- Odors. All the alternatives would generate unpleasant odors, as volatile contaminants including naphthalene in the soils are exposed to air during excavation, stockpiling and grading activities. Alternative 2 would generate the least amount of odors because soil disturbing activities would be limited to grading and installation of the final Site cap. Alternative 5 would also generate relatively few odors because the primary remedial technologies would be implemented through boreholes and wells. Alternative 6 would generate significant odors because heavily contaminated soils from the center of the Site would be excavated, screened to remove debris and blended to prepare them for thermal treatment. All the ISS-based alternatives (4, 7, and the Selected Remedy) would generate odors as soil is excavated and stockpiled to make room for soil swell during ISS mixing. Of the ISS-based alternatives, Alternative 4 would generate the least amount of odors because the vast

majority of the soils would be treated in-situ with auger mixing. Alternative 7 and the Selected Remedy would generate more odors during excavator mixing activities.

- Safety. Alternative 2 would cause the least risk to Site workers. No deep excavation work would be required and there would be little exposure to NAPL-contaminated soils. Alternatives 4, 7, and the Selected Remedy would pose moderate risks to workers excavating and stockpiling soils and operating large soil mixing equipment. Alternatives 5 and 6 would both introduce additional risks to workers due to the high heat used for thermal treatment. Alternative 6 would pose the greatest risk to workers; excavation depths of 20 feet and handling of high temperature steam, vapor and fluids would pose increased risks.

2.10.2.4 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other government entities are also considered.

Of the active treatment options, Alternative 2 is the easiest to implement. Refurbishing groundwater extraction wells, installing new wells, and upgrading the GWTP can be accomplished using conventional construction equipment.

Under Alternative 4, removing debris from inside the existing sheet pile wall to allow for treatment up to the edge of the sheet pile wall would be difficult. Large boulders, pieces of a former wooden bulkhead and other debris are buried next to the wall, at depths up to 10 feet. The former facility bulkhead is still intact along most of the wall interior and it would need to be removed prior to ISS mixing. Removing soil and debris from inside the wall would require shoring and would have to be done in sections. The work would require a large crane and would be noisy. The other significant challenge posed by Alternative 4 would be management of soil "swell" generated during ISS treatment. Alternative 4 would treat 325,000 CY of soil with ISS. A swell rate of 25% would generate an additional 81,250 CY of material. Managing this much material on Site will be difficult, and the task will be even more challenging if the swell rate is higher than expected.

Alternative 5 would face many of the same challenges as the 2003 stream enhanced extraction pilot study. These include: keeping the steam hot enough along the length of the injection wells to effectively treat the contamination, keeping the temperature in the extraction system hot enough to prevent the COCs (particularly naphthalene) from solidifying and clogging the pipes, and treating grossly contaminated groundwater in the GWTP.

Alternative 6 would require excavating heavily contaminated soil to a depth of 20 feet. This would be difficult, requiring dewatering and shoring to support the excavation areas. The soil would need to be screened to remove rocks and debris, then blended and stockpiled before thermal treatment. Thermal treatment would require an on-Site thermal desorption unit and large quantities of propane. Vapors from the thermal desorption unit would require treatment in a thermal oxidizer. Treatment of deeper soils with thermal enhanced extraction would face the same implementation challenges as Alternative 5. Combining the two remedial technologies, each of which are technically complex, make Alternative 6 the most technically complex and difficult alternative to implement.

Alternative 7 and the Selected Remedy would face similar challenges as Alternative 4, but managing soil swell would be less difficult because less soil would be treated with the ISS technology. Of the three ISS-based remedies, Alternative 7 would be the most difficult to implement because it would require mobilization and coordination of three different treatment technologies.

2.10.2.5 Cost

Costs include estimated capital, long-term O&M, and present value costs.

Capital costs, O&M costs, and net present value (NPV) costs for each alternative are provided in Table 2-9. Cost estimates for Alternatives 4 -7 and Modified Alternative 7 include maintenance and periodic costs needed to operate the remedy for approximately 30 years. The cost estimate for Alternative 2 however, includes 100 years of O&M. A longer O&M period was included in Alternative 2 because of the relatively high annual cost of continuous groundwater extraction and treatment, and because the O&M would need to continue well beyond 30 years. In the FFS, EPA estimated that it would take more than 300 years for contaminant concentrations to reach levels low enough that containment would no longer be required. This estimate was based on the measured and forecasted rate of anaerobic degradation of PAHs (in particular, naphthalene) in the groundwater. The estimated cost of the Selected Remedy ($61.8 million) falls in the middle of the cost range for the FFS alternatives ($19.1 to $135 million).

Note: Key Cost Estimate Considerations – The cost estimates in this RODA are present value costs, calculated using a 7 percent discount rate as required by EPA guidance (EPA, 2000b). Applying a discount rate to calculate the present value of future construction costs impacts the overall cost estimate and has the greatest effect on alternatives with high costs in the future. To see how present value calculations impact the cost estimates, see Table 2-9, which presents estimated costs for each alternative using nondiscounted dollars, as well as present value costs using discount rates of both 7 percent and 1.4 percent (1.4 percent was the Office of Management and Budget's recommended rate for construction cost estimating in 2016, when the cost estimates were developed.) The FFS was prepared in 2016; costs presented in this RODA are in 2016 dollars.

Table 2-9. Remedial Alternatives Cost Summary

Alternative	Total Present Worth Cost: Non-Discounted Cost	Total Present Worth Cost: 1.4 -Percent Discount Rate	7-Percent Discount Rate
Alternative 2	$77.2 million	$46.2 million	$19.1 million
Alternative 3	Screened Out - Not Costed	Screened Out - Not Costed	Screened Out - Not Costed
Alternative 4	$87.1 million	$85.5 million	$80.8 million
Alternative 5	$115.8 million	$108.6 million	$87.9million
Alternative 6	$176.2 million	$165.8 million	$134.9million
Alternative 7	N/A	N/A	N/A
Phase 1 only	$77.8 million	$70.6 million	$52.6 million
Phase 1 and Phase 2	$99.6 million	$89.0 million	$61.9 million
Selected Remedy	N/A	N/A	N/A
Phase 1 only	$77.2 million	$72.3 million	$57.3 million
Phase 1 and Phase 2	$81.3 million	$76.1 million	$59.7 million

Note: The discrepancy between this table and Table 2-12 for the Selected Remedy/Phase 1 and Phase 2/7-Percent Discount Rate is due to rounding of individual item costs before applying the discount rate.
N/A not applicable

2.10.3 Modifying Criteria Evaluation

This section summarizes the comparative evaluation of the alternatives based on the modifying criteria of Community Acceptance and State/Tribal Acceptance. EPA received comments on the Proposed Plan from 53 individuals and organizations, including the City of Bainbridge Island, the Suquamish Tribe, and state government agencies including Ecology.

2.10.3.1 Community Acceptance

Many commenters voiced support for Upland Alternative 4 – In-Situ Solidification/Stabilization. A similar number of commenters voiced support for Alternative 6 - Excavation, Thermal Desorption, and Thermal-Enhanced Extraction, or for a modified version of Alternative 6. In support of Alternative 4, the commenters explained that they preferred the faster pace of the cleanup, noting that Alternative 4 would require four years of active construction, while EPA's Proposed Alternative 7 would require 10 to 13 years to implement. Community members, many of whom have lived near the Site since cleanup work began in the late 1980s, expressed a clear desire to complete the cleanup quickly so the Site can be re-used as soon as possible. Commenters who supported Alternative 6 cited a strong preference for treatment that would remove or destroy the contamination. Many of them were skeptical that ISS would perform well over a long period of time. Some were concerned about the potential for an earthquake or rising sea levels to impact the remedy in the future.

A summary of the comments received and EPA's responses are provided in Part 3 of this RODA.
EPA modified Alternative 7 to address the two fundamental concerns raised by most commenters: (1) the duration of construction, and (2) the exent of active treatment. The modifications to Alternative 7 will significantly shorten the overall duration of construction and increase the volume of NAPL contaminated soil that is treated by ISS.

2.10.3.2 State and Tribal Acceptance

Ecology concurs with the selected remedy for the upland soil and groundwater. A copy of their concurrence letter is provided as Appendix 2A.

In comments on the the Proposed Plan, the Suquamish Tribe stated that the Tribe's treaty-reserved right to harvest clams and other fishery resources within Eagle Harbor have been impacted from Wyckoff Site contamination for decades, and these releases have also affected aquatic biota. Regarding cleanup measures for upland soil and groundwater, the Tribe raised a particular concern with the outfall pipe, common to all the remedial alternatives, that will drain stormwater from the surface of the final Site cap. The Tribe wants to ensure the discharge does not impact state-approved shellfish growing areas or eelgrass beds east of the FPA. The Tribe has been working cooperatively with EPA since the onset of the RI/FS and has stated that they plan to continue to do so throughout the life of the project.

EPA offered the Suquamish Tribe an opportunity for formal, Government to Government consultation before finalizing this RODA. The Tribe …. (I am still waiting for final response but am fairly certain the response will be "no thank you").

2.10.4 Summary of the Comparative Analysis of Alternatives

A summary of the comparative analysis of the retained alternatives is described as follows.

Alternative 1 is not protective; it was therefore eliminated from further consideration. Alternative 2 was determined to be protective, but it ranks the lowest on Short-Term Effectiveness because it would require more than 300 years of operations to achieve cleanup goals. Alternative 2 appears to have the lowest cost than the other alternatives, but because the cost estimate includes only 100 years of O&M when more than 300 years of O&M would be needed, the actual cost would be higher.

In comparing the remaining alternatives, Alternatives 4 and 7 and the Selected Remedy, all of which rely on ISS as primary remedial technology, provide the best balance relative to the balancing and modifying criteria. Upland Alternatives 5 and 6 provide similar levels of long-term effectiveness but are considerably more expensive and require longer timeframes to implement than the ISS-based remedies. Upland Alternatives 5 and 6 are also more energy intensive because they require heating soil through steam injection (Alternatives 5 and 6) and in an on-Site thermal desorption unit (Alternative 6 only).

Alternatives 4, 7 and the Selected Remedy have numerous benefits. Alternative 4 can be implemented more quickly than both phases of Alternative 7 and treats more NAPL. The disadvantages of Alternative 4 include the cost, difficulty, and uncertainty of removing subsurface debris along the entire length of the inside of the perimeter sheet pile wall, the potential for incomplete treatment if deeply buried debris cannot be removed, and the challenges posed by managing large swell volumes. Alternative 7 has two distinct construction phases, with a period of monitoring between the two phases. This provides flexibility, allowing the results of Phase 1 to guide the selection and application of remedial technologies in Phase 2.

In developing the Selected Remedy, EPA strove to maintain flexibility while addressing the most frequently voiced concerns raised by the public during the comment period. EPA considered ways to accelerate the pace of the cleanup and maintain or increase the amount of active treatment, without dramatically increasing costs. The Selected Remedy retains the flexibility of Alternative 7 by including two phases, but shortens the monitoring period between the phases and the overall time required for construction by 23 years, assuming both phases are needed. By reducing the number of remedial technologies to be employed, the Selected Remedy simplifies remedial construction.

2.11 Principal Threat Waste

The NCP establishes the expectation that treatment will be used to address the principal threats posed by a Site whenever practicable (40 CFR 300.430[a] [1] [iii] [A]). In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or will present a significant risk to human health or the environment should exposure occur.

EPA has determined that NAPL in the upper aquifer is principal threat waste, based on the large mass present, the toxicity of the chemicals found in the NAPL, and the presence of NAPL on the aquitard and in the lower aquifer beneath the aquitard. In the center of the FPA, mobile NAPL occurs in layers with an aggregate thickness of more than 10 feet.

The Selected Remedy meets the statutory preference for treatment. By encapsulating NAPL in a cement-like matrix the Selected Remedy will eliminate/reduce contaminant toxicity and mobility.

2.12 Documentation of Significant Changes to the Remedy Presented in the Proposed Plan

Modified Alternative 7 was developed in response to public comments on the Proposed Plan. The modifications made to Alternative 7 address key concerns raised during the public comment period about the time required for construction and the extent of active treatment measures. The significant changes adopted since the Proposed Plan are described below. The Selected Remedy is discussed further in Section 9.2.8, in Section 13 and in Part 3, the Responsiveness Summary.

2.12.1 Modification of Remedial Action Objective 2

In the 2016 Proposed Plan, RAO 2, which addresses risk from upper aquifer groundwater, was:

> *"Prevent use of Upper Aquifer groundwater for irrigation or industrial purposes that would result in unacceptable risks to human health."*

The RAOs were developed before the FFS, when steam-enhanced extraction was being evaluated as a potential remedial technology. If steam-enhanced extraction had been selected, it may have been possible to use upper aquifer groundwater for industrial purposes (for example, in a heat exchanger) following remedy completion. The RAO left open that possibility. However, the Selected Remedy will not support the use of upper aquifer groundwater. Much of the soil within the FPA will be solidified in a

soil/concrete matrix, from which it will not be possible to extract groundwater. To avoid future confusion over the potential for industrial use of the groundwater, the RAO has been re-written, and now reads:

"Prevent human exposure to contaminated upper aquifer groundwater."

RAO 2 will be met through containment measures (the barrier wall and Site wide cap) and ICs prohibiting construction of groundwater wells.

2.12.2 Modification of Soil Cleanup Levels

As described in Section 8.2.1, soil CULs from the 2000 ROD were updated using current information on the toxicity of PAHs. The previous (2000) and new final CULs are listed in Table 2-4.

2.12.3 Accelerating the Pace of Cleanup

Many public commenters expressed concern with the long timeframe needed to achieve RAOs under the Preferred Alternative identified in the Proposed Plan. Several commenters, including the City and the Bainbridge Island Parks Foundation, preferred Alternative 4 because it could be completed on a shorter timeline than EPA's proposed alternative.

To address this concern, EPA:

- Increased the area and volume of contamination to be treated with ISS during Phase 1 of the remedy
- Decreased the amount of time for monitoring between Phases 1 and 2 from 5 years to 2 years
- Eliminated NAPL recovery planned in Phase 1 in favor of additional ISS, to be implemented using excavator mixing where appropriate
- Eliminated thermal enhanced recovery and EAB in Phase 2, and replaced it with additional ISS, to be implemented using excavator mixing

The changes listed above will shorten the amount of time needed to implement the remedy, from a total of 34 years, assuming both Phase 1 and Phase 2 are needed, to 11 years, assuming both Phase 1 and Phase 2 are needed. By moving treatment areas from Phase 2 into Phase 1, these changes will also lower the likelihood that Phase 2 actions will be needed.

2.12.4 Addition of a Groundwater Barrier and/or Cutoff Wall

Several commenters, including the Suquamish Tribe, expressed concern about the 10 perimeter drains described in the Proposed Plan. The drains were included as a "common element" in all the alternatives. The commenters questioned whether the drains could cause erosion on the beaches, release contamination to the beaches, or impact eelgrass or clams though the discharge of fresh water. Other commenters noted that maintaining the drains over time will be burdensome, particularly if doing so requires frequent changing of the carbon filters.

To address this concern, a southern groundwater cutoff wall was added to the Selected Remedy. By diverting clean groundwater around the contamination, the cutoff wall will reduce the amount of groundwater that will need to be managed in the future. Adding the cutoff wall reduced the estimated number of perimeter drains from ten to four. The final number of perimeter drains and their location will be determined during remedial design and following completion of Phase 1 activities.

2.13 Selected Remedy

Based on consideration of CERCLA requirements, the detailed analysis of remedial alternatives, and public comments, EPA's interim Selected Remedy for upland soil and groundwater is Modified Alternative 7 -- In-Situ Stabilization with Groundwater Cutoff Wall. The estimates of areas, volumes, time to reach cleanup objectives, and costs for the Selected Remedy are based on RI/FS data, a 2017 supplemental technical memorandum to the RI/FS (CH2M, 2019), and other information included in the Administrative Record. Final treatment areas will be determined during remedial design. The general sequence and duration of selected remedy's key elements are listed in Table 2-10.

Table 2-10. Selected Remedy General Sequence and Duration

Years 0 to 3	Years 4 and 5	Year 6	Year 7	Years 8 to 10
• GWTP O&M • Abandon recovery and monitor wells within the ISS footprint and install replacement wells • ISS reagent mix testing • Phase 1 Remedial design	• Conduct Phase 1 ISS treatment • Install groundwater cutoff wall • Passive discharge/treatment system design • GWTP O&M	• Construct passive discharge/treatment systems • GWTP O&M • Phase 1 performance monitoring	• Passive discharge/treatment O&M • Phase 1 performance monitoring • Phase II determination and design	• Phase II ISS (if necessary) • GWTP O&M in year 8 only • Passive groundwater discharge/treatment O&M • Construct outfall and final cap • GWTP decommissioning

2.13.1 Selected Remedy Components

The primary components of the selected remedy are described in the following subsections.

2.13.1.1 Concrete and Debris Demolition, Decontamination and Reuse

Buried concrete that could prevent or impede ISS implementation will be removed and/or demolished, pressure-washed to remove visible creosote, and then crushed to segregate rebar for recycling. Concrete will be hauled off Site for disposal or recycling, or re-sized and stockpiled for subsequent on-Site reuse. Decontamination fluids will be treated in the on-Site GWTP and any recovered creosote transported off Site for disposal.

2.13.1.2 Sitewide Debris Removal

Other buried utilities and debris (for example, process pipes, storm drains, electrical conduit, and bulkheads) are also known to exist given the facility's long history. This work will include excavating an estimated 66,600 CY of material and disposing of an estimated 670 CY of hazardous waste at an off-Site RCRA Subtitle C facility. The remaining material will be sorted and sent off Site for recycling and/or landfill disposal.

2.13.1.3 Bulkhead Debris Removal

The area between the original Site bulkhead and the current perimeter sheet pile wall was filled with rock and concrete debris that must be removed to permit ISS of subsurface material. Portions of the original facility bulkhead will also be removed. An estimated 24,000 CY of rock, bulkhead, and other materials will be removed and segregated, with approximately 1,000 CY going off Site for disposal in a RCRA Subtitle C facility, and approximately 1,000 CY going off Site for disposal in a Subtitle D facility. The remaining material will be sorted with recyclable materials sent off Site and nonrecyclable material incorporated into the ISS monolith beneath the final Site cap.

2.13.1.4 Other Miscellaneous Demolition

The components of the 2012/2013 steam-enhanced extraction pilot test, including equipment and associated infrastructure will be demolished and removed. Metals and other material that can be recycled will be sent off Site, and the remainder will be sent off Site for landfill disposal. Other Miscellaneous Demolition also includes excavation of an estimated 100 CY of PAH contaminated soil near monitoring well PZ-11. The excavated soil will either be sent off Site for landfill disposal or stockpiled on-Site for subsequent treatment and incorporation in the ISS monolith.

2.13.1.5 Stormwater Infiltration Trench

A stormwater infiltration trench will be installed where needed along the southern boundary of the FPA to intercept and divert surface water away from the active construction area.

2.13.1.6 Groundwater Treatment Plant Operations and Well Replacement

During debris removal activities and through implementation of Phase 1 ISS, the GWTP will continue to operate, using the existing and/or replacement hydraulic containment wells. Extracted groundwater will be treated in the GWTP and discharged through the existing outfall, as described in the 2000 ROD.

Before ISS begins, a subset of the existing extraction wells, located within the ISS treatment footprint, will be plugged and abandoned and replacement wells will be installed within the no treatment areas. Additionally, a subset of the existing upper and lower aquifer monitoring wells will be plugged and abandoned and replacement monitoring wells installed within the no treatment areas.

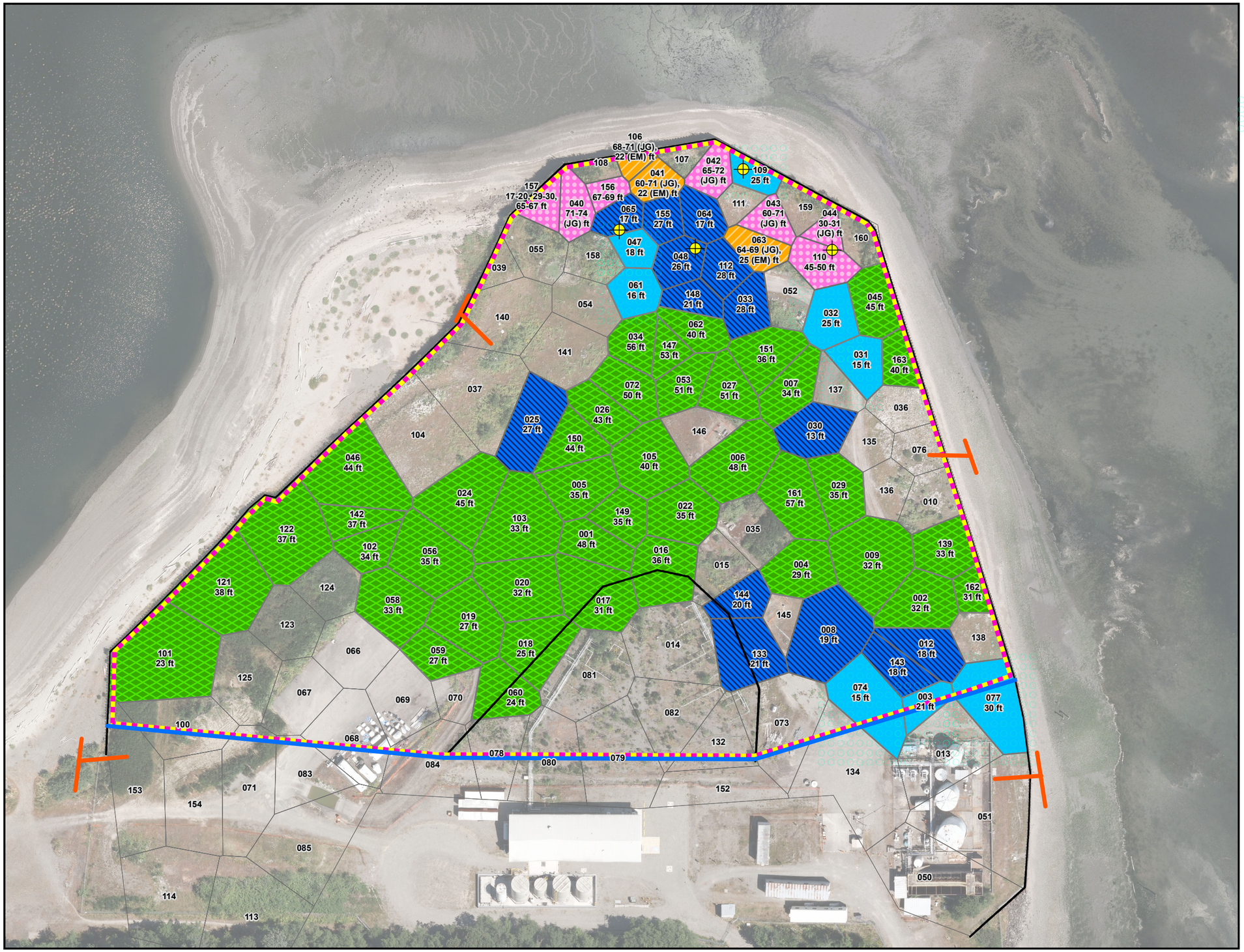
2.13.1.7 Reagent Mix Design

Prior to Phase 1 ISS, mix design testing will be performed to determine the optimum reagents, mix ratios, and characteristics of the treated material. Typical reagents include Portland cement, blast furnace slag, and bentonite. Reuse of crushed concrete generated from debris removal and demolition activities will also be evaluated as a reagent component. The mix design will be evaluated by measuring hydraulic conductivity, unconfined compressive strength, and overall leaching reduction in a series of tests prepared using NAPL-contaminated soil obtained from the Site. Other test parameters may be identified during remedial design.

2.13.1.8 Phase I In Situ Soil Solidification/Stabilization

Prior to commencing ISS, treatment areas will be excavated to a depth of approximately 7 feet, creating a sump to contain the swell volume that accompanies ISS. The excavated material will be treated in an aboveground containment structure using the ISS reagent, then stockpiled on Site for later use in Site grading and contouring. In the FFS, EPA assumed that this material will be eventually covered by the final site cap. Depending on the amount of soil swell generated and stockpile management considerations, it may be necessary to send a portion of this material offsite for disposal.

During Phase 1, approximately 236,000 CY of NAPL contaminated soil will be solidified through a combination of ISS auger mixing, jet grout injection, and excavator mixing. These methods are described in Alternative 4 (Section 9.2.4). It is estimated that auger mixing would be used to treat material at depths up to 56 feet and will be used to treat most of the target areas. Jet gout injection will be used in areas too deep for auger mixing; these target areas are in the northern portion of the Site, where DNAPL has accumulated above the aquitard. Where NAPL contamination is shallow – within 30 feet of the surface, ISS treatment may be accomplished using track-mounted excavators. Figure 2-6 shows the approximate boundaries of the treatment areas where the three mixing techniques will be employed. During remedial design, a more effective or efficient array of mixing techniques and equipment may be selected.



LEGEND

- Polygon Number / Maximum Depth of Treatment (feet) (032 / 25 ft)
- Not Selected for Treatment
- Phase 1 - Excavator Mixing
- Phase 1 - ISS Auger
- Phase 1 - Jet Grout
- Phase 1 - Jet Grout and Excavator Mixing
- Phase 2 - Excavator Mixing
- Lower Aquifer Wells with DNAPL and PAH Concentrations above ROD (EPA, 2000) Cleanup Levels
- Final Site Cap Boundary
- New Cutoff Wall Keyed into Aquitard
- Drain Through Sheet Pile Wall (Nearby EAB Anticipated)
- Existing Sheet Pile Wall

Notes:
JG = jet grout
EM = excavator mixing

N

0 50 100 200 Feet

FIGURE 6
Selected Remedy ISS Treatment Methods
Record of Decision Amendment for the Wyckoff/ Eagle Harbor Superfund Site
Bainbridge Island, Washington

EPA

2.13.1.9 Groundwater Cutoff Wall

Phase 1 will include installation of a cutoff wall along the southern boundary of the FPA. The cutoff wall will connect the ends of the current U-shaped perimeter wall, resulting in a fully encircling wall around the NAPL source area. The FFS assumed a bentonite slurry wall, but other materials or construction methods could be selected during remedial design. The cutoff wall will be approximately 950 feet long and 30 feet deep, and it will be keyed into the aquitard. The approximate alignment of the cutoff wall is shown on Figure 2-6.

2.13.1.10 Phase 1 Performance Monitoring

A network of existing and replacement monitoring wells will be sampled to determine how Phase I ISS changes upper and lower aquifer water quality conditions. The monitoring program will include measurement of water levels, COC concentrations, and NAPL thickness in groundwater, and may include other elements.

The results of the Phase 1 performance monitoring data will be used to determine whether additional ISS treatment is needed in Phase 2. If Phase 1 performance monitoring data indicate the presence of NAPL in monitoring wells in and around the passive drain collection system, or if dissolved phase COC concentrations near the passive drains would require change-out of the carbon filters more than four times per year, then Phase 2 ISS will be implemented.

A two-year monitoring period is planned. However, the monitoring period may be modified based on Phase 1 monitoring results. For example, the monitoring period may be extended if conditions are still changing substantially at the end of year two.

2.13.1.11 Passive Groundwater Discharge/Treatment

When the hydraulic containment wells currently in operation are turned off, the water level could rise, increasing hydrostatic pressure on the perimeter wall and potentially flooding portions of the FPA. To prevent this, a passive discharge/treatment system will be used for long-term management of groundwater elevations in the upper aquifer.

The passive discharge/treatment system will consist of an estimated two interior drains and two exterior drains inside and outside the cutoff wall. The approximate location of the drains is shown on Figure 2-6. Each drain system will include three components: a collection system, a treatment system using granular-activated carbon or other treatment media to remove dissolved-phase COCs, and a pipe that conveys the treated water through the existing sheet pile wall and the new bulkhead.

The interior drain systems will be placed in areas where NAPL is absent and dissolved phase COC concentrations are expected to be lower. For the exterior drain systems, COC concentrations are expected to be low, and the water may not require treatment before discharge.

During remedial design and the initial phase of Phase 1 remedial action, additional information will be collected to determine where treatment is required, and the number and size of drain systems needed. This information may justify the need for additional or fewer drain systems.

Discharge limits for the perimeter drains will be developed to meet Clean Water Act and MTCA requirements when the number, location, and maximum discharge rates of the drains are known. The discharge limits will be documented in a future CERCLA decision document (for example, an ESD or the final ROD for the Site).

2.13.1.12 Phase 2 In-Situ Soil Solidification/Stabilization

The initial target areas for Phase 2 excavator mixing are shown on Figure 2-6. The final Phase 2 treatment areas will be informed by the results of Phase I monitoring and will be determined during Phase 2 design. In Phase 2, ISS will be employed where needed to treat areas where remaining NAPL

contamination is contributing to high concentrations of COCs in groundwater near the passive drain systems. The FFS assumed that Phase 2 will be accomplished using excavator mixing. During remedial design for Phase 2, a more effective or efficient mixing method may be selected.

2.13.1.13 Final Site Cap

A multi-layer cap will be installed to prevent surface water from infiltrating into ISS treated areas, which will be relatively impermeable. The cap will also protect the upper surface of the stabilized material. The cap will cover the entire area inside the perimeter wall, approximately 8.1 acres. The conceptual design for the Site cap assumes a high-density polyethylene geomembrane overlain by 12 inches of drainage material and 12 inches of topsoil, with hydroseeding to provide a vegetative cover. A geotextile cushion would be placed over the geomembrane to provide puncture protection for the drainage layer. Different cap materials or layers may be selected during remedial design. The cap will be designed to accommodate ISS swell and the final grading plan.

2.13.1.14 New Stormwater Outfall

A new outfall pipe will be installed to discharge stormwater collected from the surface of the final Site cap. The peak stormwater discharge rate is estimated at 11 cubic feet per second. A 20-inch diameter pipe is planned, but the size may be adjusted during remedial design. The alignment of the pipe – east to Puget Sound or north/northwest to Eagle Harbor – will be determined during design. Other stormwater management measures identified during remedial design that would reduce peak flows or improve stormwater discharge water quality may also be implemented.

2.13.1.15 Institutional Controls

Restrictive covenants will be established to: (1) protect the final Site cap from future construction actions that would expose workers or the public to contamination left below the cap or compromise the function of the cap, (2) prohibit the installation of groundwater wells in the FPA, (3) prohibit the installation of groundwater wells in the lower aquifer outside the FPA that could cause the contaminant plume to spread by drawing contaminants toward the new well(s), and (4) protect any habitat constructed or enhanced as compensatory mitigation for remedial construction impacts.

2.13.1.16 Groundwater Treatment Plant Demolition and Well Abandonment

Following ISS construction, groundwater conditions in the upper aquifer will be monitored. The FFS assumed a one year “shake down” period, in which groundwater concentrations are expected to stabilize. However, it may take longer – up to three years, to determine the collective benefit of remedial measures on upper and lower aquifer groundwater. The GWTP will be demolished when it is clear there is no longer a need for active pump and treat operations. All groundwater extraction wells and many of the upper and lower aquifer monitoring wells will be plugged and abandoned. Several upper and lower aquifer monitoring wells will be retained for future sampling and analysis to support five-year reviews and selection of a final lower aquifer groundwater remedy.

2.13.1.17 Long-Term Monitoring

A network of existing and/or new monitoring wells will be sampled to track upper aquifer groundwater conditions, while lower aquifer wells will also be sampled to confirm that no further degradation is occurring per RAO 4. The performance of the remedial actions will be assessed using the measures described in Table 2-11.

2.13.2 Summary of the Rationale for the Selected Remedy

The Selected Remedy is protective of human health and the environment, complies with ARARs for this interim action, and provides the best balance of tradeoffs among the balancing criteria. It reduces risks within a reasonable time frame, is practicable and cost-effective, provides for long-term reliability of the

remedy, and minimizes reliance on ICs. It will achieve substantial risk reduction and long-term effectiveness by treating NAPL and the most contaminated soils and groundwater through ISS and containing low-level contamination remaining after treatment. The benefits of immobilizing the NAPL more quickly through ISS outweigh the benefits of other alternatives considered that would take longer to remove NAPL. Remaining risks due to low levels of contamination outside of the active treatment are managed through containment measures and ICs. For alternatives that treat more waste, the additional costs and implementabilty challenges are not proportional to the overall increase in long-term effectiveness.

Table 2-11. Remedial Action Objective Achievement Measures

RAO	Measures to Define when the RAO has been Met
RAO 1: Reduce human health risks associated with direct contact, ingestion, or inhalation of contaminated soil to levels that allow outdoor recreational use.	This RAO will be achieved when two conditions have been met: (1) the Site-wide cap is installed using soils in the surface layer that meet the CULs provided in Table 2-4, and (2) ICs, consistent with the Washington Uniform Environmental Covenants Act, are in place to ensure that any disturbance of the cap is done in a way that prevents human exposure to contaminated soils remaining below the cap.
RAO 2: Prevent human exposure to upper aquifer groundwater.	This RAO will be met when the final site cap has been constructed and ICs are in place to prevent the installation of groundwater wells in the FPA. There are no numeric cleanup levels for upper aquifer groundwater in the FPA.
RAO 3: Reduce risks associated with discharge of contaminated upper aquifer groundwater to Eagle Harbor and Puget Sound to levels that protect aquatic life and human consumption of resident fish and shellfish.	This RAO will be achieved when groundwater discharged through passive drains in the perimeter wall meets discharge limits protective of human health and aquatic life. The number and location of perimeter drains, and the volume of water that will need to be discharged will be determined during remedial design and construction. When sufficient information is available, discharge limits will be developed for the perimeter drains, consistent with the substantive requirements of Section 402 of the Clean Water Act and Washington Administrative Code 173-220.
RAO 4: Prevent further degradation of the lower aquifer and prevent exposure to lower aquifer groundwater that would result in unacceptable risk to human health.	The objective of preventing further degradation will be met if lower aquifer groundwater, contaminated above MCLs, does not spread south/southwest to monitoring wells located between the former processing area and existing drinking water wells. The objective of protecting human health will be met when ICs are in place to prohibit the withdrawal of lower aquifer groundwater from contaminated portions of the aquifer.

2.13.3 Cost Estimate: Selected Remedy for Upland Soil and Groundwater

A break-down of remedial construction and O&M costs for the Selected Remedy is shown in Table 2-12. The information presented in Table 2-12 is based on the best available information regarding the anticipated scope of the Selected Remedy. Changes in the cost elements are likely to occur as a result of the new information and data collected during remedial design. Major changes may be documented in the form of a memorandum to the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

Table 2-12. Selected Remedy Cost Estimate Summary

Cost Element	Quantity	Units	Unit Costs	Nondiscounted Subtotal	Project Year(s)	Discounted Cost (7%)
Common Elements						
Pre-construction - includes precon submittals, permitting, Site preparation and surveying	1	lump sum	$879,000	$879,000	0	$879,000

Cost Element	Quantity	Units	Unit Costs	Nondiscounted Subtotal	Project Year(s)	Discounted Cost (7%)
Concrete Demolition, Decontamination/Reuse - includes demolition of 8,030 CY of former building foundations, decontamination, crushing and recycling/disposal.	1	lump sum	$2,324,000	$2,324,000	1	$2,161,320
Debris Removal - includes removal, treatment and disposal of utility lines, electrical conduit, former bulkheads and other buried debris in the FPA	1	lump sum	$3,195,000	$3,195,000	1	$2,971,350
Other Demolition - includes demolition, removal, and disposal of equipment from steam-enhanced extraction pilot study and asphalt pad	1	lump sum	$2,832,000	$2,832,000	2	$2,463,840
Bulkhead debris disposal - removal of debris buried next to the sheet pile wall, including approximately 8,500 CY of rocks, 14,000 CY of construction debris and soil, and 1,300 CY of bulkhead timbers	1	lump sum	$4,224,000	$4,224,000	2	$3,674,880
Stormwater Infiltration trench to divert surface water from the active work area	1	lump sum	$214,000	$214,000	3	$175,480
Passive Groundwater Treatment/Discharge - includes installation of groundwater collection system, 4 passive drains through the perimeter wall, and carbon filters in the drains	1	lump sum	$373,000	$373,000	6	$249,910
Upland Cap - includes subgrade preparation and construction of cap covering 39,150 square feet including geomembrane layer, drainage layer, clean topsoil	1	lump sum	$4,100,000	$4,100,000	9	$2,214,000
New Outfall - installation of a 20-inch diameter pipe to convey stormwater from the surface of the final Site cap to a discharge point approximately 800 feet offshore	1	lump sum	$3,294,000	$3,294,000	9	$1,778,760
Remedial Alternative Construction Phase 1						
Extraction Well System						
Install 6 new wells outside the ISS footprint to maintain negative hydraulic gradient during construction	6	well	$92,000	$552,000	3	$452,640
Refurbish 2 existing wells	2	well	$2,300	$4,600	3	$3,772
Pipe racks, fittings, power to new wells	1	lump sum	$168,550	$168,550	3	$138,211
Upgrade GWTP	1	lump sum	$50,000	$50,000	3	$41,000
Extraction System Project Management 6%	0.06	N/A	$775,150	$46,509	3	$38,137
Extraction System Construction Management 8%	0.08	N/A	$775,150	$62,012	3	$50,850
Extraction System Design 12%	0.12	N/A	$775,150	$93,018	3	$76,275
Extraction System Construction Report	1	lump sum	$20,000	$20,000	3	$16,400

Cost Element	Quantity	Units	Unit Costs	Nondiscounted Subtotal	Project Year(s)	Discounted Cost (7%)
Contingency (10% Scope + 15% bid)	0.25	N/A	$996,689	$249,172	3	$204,321
ISS Construction						
ISS Auger Mixing Start-up Activities						
Pre-Construction Activities	1	lump sum	$255,000	$255,000	4	$193,800
Equipment Mobilization & Setup	1	lump sum	$1,045,032	$1,045,032	4	$794,224
Install monitoring wells	20	well	$17,600	$352,000	4	$267,520
ISS Auger Mixing						
Core Area Excavation - remove top 7 feet of soil in ISS area to make room for soil swell	9	week	$55,425	$498,825	N/A	N/A
Auger mixing equipment and labor	101	week	$159,310	$16,090,310	N/A	N/A
Auger Mix Materials: Portland Cement	21301	ton	$125	$2,662,625	N/A	N/A
Auger Mix Materials: Bentonite	1874	ton	$325	$609,050	N/A	N/A
Demobilization Auger mixing equipment	1	lump sum	$464,384	$464,384	N/A	N/A
Auger Mix Project Management 5%	0.05	N/A	$23,929,663	$1,196,483	N/A	N/A
Auger Mix Construction Management 6%	0.06	N/A	$23,929,663	$1,435,780	N/A	N/A
Auger Mix Design 6%	0.06	N/A	$23,929,663	$1,435,780	N/A	N/A
Auger Mix Construction Report	1	lump sum	$100,000	$100,000	N/A	N/A
Auger Mix Contingency (10% scope + 15% bid)	0.25	N/A	$28,097,705	$7,024,426	N/A	N/A
ISS Excavator Mixing						
Ex situ soil mixing equipment and labor	15	week	$62,818	$942,270	N/A	N/A
Ex situ mix Materials: Portland Cement	7150	ton	$125	$893,750	N/A	N/A
Ex situ mix Materials: Bentonite	357	ton	$325	$116,025	N/A	N/A
Excavator Soil Mixing, including mobilization/demobilization, setup of grout plant, mixing 19,544 CY soil	1	lump sum	$1,613,520	$1,613,520	N/A	N/A
Excavator Mixing Project Management 5%	0.05	N/A	$1,613,520	$80,676	N/A	N/A
Excavator Mixing Construction Management 6%	0.06	N/A	$1,613,520	$96,811	N/A	N/A
Excavator Mixing Design 8%	0.08	N/A	$1,613,520	$129,082	N/A	N/A
Excavator Mixing Construction Report	1	lump sum	$25,000	$25,000	N/A	N/A
Excavator Mixing Contingency (10% scope + 15% bid)	0.25	N/A	$1,945,089	$486,272	N/A	N/A
ISS Jet Grouting						
Jet grouting pre-construction activities	1	lump sum	$85,000	$85,000	N/A	N/A
Jet grouting mobilization	1	lump sum	$174,998	$174,998	N/A	N/A

Cost Element	Quantity	Units	Unit Costs	Nondiscounted Subtotal	Project Year(s)	Discounted Cost (7%)
Jet grouting equipment and labor	31	week	$97,671	$3,027,801	N/A	N/A
Jet grouting materials: Portland Cement	1300	ton	$125	$162,500	N/A	N/A
Jet grouting materials: Bentonite	65	ton	$325	$21,125	N/A	N/A
Jet Grouting Demobilization	1	lump sum	$97,924	$97,924	N/A	N/A
Jet Grouting Project Management 5%	0.05	N/A	$3,569,348	$178,467	N/A	N/A
Jet Grouting Construction Management 5%	0.06	N/A	$3,569,348	$214,161	N/A	N/A
Jet Grouting Design 8%	0.08	N/A	$3,569,348	$285,548	N/A	N/A
Jet Grouting Construction Report	1	lump sum	$50,000	$50,000	N/A	N/A
Jet Grouting Contingency 25%	0.25	N/A	$4,297,524	$1,074,381	N/A	N/A
Subtotal - All Phase 1 ISS	***N/A***	***N/A***	***N/A***	***$41,272,974***	***N/A***	***N/A***
Half of subtotal (Year 1 of ISS)	N/A	N/A	N/A	$20,636,487	4	$15,683,730
Half of subtotal (Year 2 of ISS)	N/A	N/A	N/A	$20,636,487	5	$14,651,906
Groundwater Cutoff Wall						
Cutoff wall labor & equipment	4	week	$44,700	$178,800	5	$126,948
Cutoff wall: Trench Installation	2111	CY	$450	$949,950	5	$674,465
Cutoff wall: Slurry installation	2111	CY	$290	$612,190	5	$434,655
Cutoff wall: trench backfill material	3166	ton	$22	$69,652	5	$49,453
Cutoff wall Project Management 5%	0.05	N/A	$1,810,604	$90,530	5	$64,276
Cutoff wall Construction Management 6%	0.06	N/A	$1,810,604	$108,636	5	$77,132
Cutoff wall Design 8%	0.08	N/A	$1,810,604	$144,848	5	$102,842
Cutoff wall Construction Report	1	lump sum	$25,000	$25,000	5	$17,750
Subtotal: Groundwater Cutoff Wall	***N/A***	***N/A***	***N/A***	***$2,180,000***	***N/A***	***$1,548,000***
Performance Monitoring following Phase 1	***1***	***lump sum***	***$200,000***	***$200,000***	***6***	***$134,000***
Performance Monitoring Following Phase 2	***1***	***lump sum***	***$200,000***	***$200,000***	***7***	***$124,000***
Remedial Alternative Construction Phase 2						
Excavator Soil Mixing, including mobilization/demobilization, setup of grout plant, mixing 25,608 CY soil	1	lump sum	$2,098,640	$2,098,640	8	$1,217,211
Excavator Mixing Project Management 5%	0.05	N/A	$2,098,640	$104,932	8	$60,861
Excavator Mixing Construction Management 6%	0.06	N/A	$2,098,640	$125,918	8	$73,033
Excavator Mixing Design 8%	0.08	N/A	$2,098,640	$167,891	8	$97,377
Excavator Mixing Construction Report	1	lump sum	$50,000	$50,000	8	$29,000
Excavator Mixing Contingency (10% scope + 15% bid)	0.25	N/A	$2,547,382	$636,846	8	$369,370

Cost Element	Quantity	Units	Unit Costs	Nondiscounted Subtotal	Project Year(s)	Discounted Cost (7%)
Final/Close-out Remedial Actions						
Well Abandonment - includes abandoning 195 2-inch wells and 357 4-inch wells	1	lump sum	$1,498,000	$1,498,000	11	$719,040
Demolish GWTP	1	lump sum	$1,000,000	$1,000,000	11	$480,000
Final Completion Report	1	lump sum	$150,000	$150,000	11	$72,000
Operations & Maintenance						
Operate GWTP	8	years	$788,000	$6,304,000	0, 1, 2, 3, 4, 5, 6, and 8	$4,995,920
Operate passive groundwater treatment system	3	years	$193,000	$579,000	7, 9, and 10	$322,310
Maintain on-Site roads	1	lump sum	$25,000	$25,000	25	$4,500
Five-Year Reports	20	N/A	$20,000	$400,000	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, and 100	$49,200
Non-Discounted and Discounted Totals	***N/A***	***N/A***	***N/A***	***$81,300,000***	***N/A***	***$59,500,000***

Source: Supplement to the NAPL Focused Feasibility Study for OU2/OU4 – Wyckoff/Eagle Harbor Superfund Site, Bainbridge Island, WA (CH2M, 2019)

Note: Costs in Table 2-12 do not match the alternative costs presented in the 2017 FFS Supplement. The FFS Supplement included costs for two additional "common element" items: access road upgrades and replacement of the perimeter wall. Because costs for those items were included in the May 2018 Beaches and Perimeter Wall RODA, they were excluded from the values presented here.

N/A not applicable

2.13.4 Estimated Outcomes of the Selected Remedy

The remedy will have numerous beneficial outcomes, including:

- Incorporation of the land into Pritchard Park. Once construction of the final cap is complete and long-term monitoring is underway, the property will be safe for recreational use and can be incorporated into Pritchard Park.
- Long-term protection of the intertidal beaches, Eagle Harbor and Puget Sound. By encapsulating NAPL in a concrete-like matrix, the remedy will provide for improved source control, lessening the potential for upland NAPL release to the intertidal beaches and promoting natural recovery.
- End of active groundwater extraction and treatment. When groundwater concentrations have declined, allowing for treatment to meet discharge requirements in the passive drain system, active groundwater extraction and treatment operations can be stopped. This will relieve Washington State taxpayers from indefinite annual operations costs of approximately $750,000.

The Selected Remedy is expected to the final remedy for soils at the site and for upper aquifer groundwater. This RODA is an interim action for groundwater in the lower aquifer. Lower aquifer groundwater will be addressed if needed in the final CERCLA decision document for the site, based on future conditions after completion of this RODA.

2.14 Statutory Determinations

Under CERCLA §121 and the NCP §300.430(f)(5)(ii), the EPA must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-Site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

2.14.1 Protection of Human Health and the Environment

In the FPA, the final cap, combined with ICs to prevent exposure to contaminants left beneath the cap, will protect human health and the environment by preventing direct contact with contaminated material and preventing construction of groundwater wells. ISS of the mobile NAPL will reduce the toxicity and mobility of principal threat wastes. There are no short-term threats associated with the Selected Remedy that cannot be controlled. In addition, no adverse cross-media impacts are expected from the Selected Remedy. The Selected Remedy also protects human health through ICs prohibiting use of contaminated lower aquifer groundwater. However, the Selected Remedy does not restore the lower aquifer to its beneficial use as a potential source of drinking water. Following completion of the Selected Remedy, conditions will be monitored in the lower aquifer. A remedial decision to address contamination in the lower aquifer will be made in a future cleanup decision document.

2.14.2 Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and the NCP §300.430(f)(l)(ii)(B) require remedial actions at CERCLA sites to at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA §121(d)(4). The modifications to the selected remedy in this interim RODA will meet federal and state ARARs specific to this action. The selected remedy will meet substantive requirements of MTCA, the Clean Water Act, and the National Emission Standards for Hazardous Air Pollutants (NESHAPS) relevant to particulate matter and air pollutants. In addition to ARARs, worker safety provisions at 29 CFR 1910 will be observed.

The selected remedy will transport waste off Site for disposal, and therefore, must comply with applicable RCRA regulations (40 CFR 260-268). Transportation of contaminated environmental media and debris to an off-Site disposal facility will be conducted pursuant to Federal and State transportation and disposal regulations. Facilities accepting these wastes will be certified to accept the wastes. Land disposal restrictions (LDRs) may apply to off-Site disposal of nonhazardous wastes but will be determined once the waste is characterized during remedial design.

2.14.3 Cost-Effectiveness

The Selected Remedy is cost-effective because the remedy's costs are proportional to its overall effectiveness (see 40 CFR §300.430(f)(l)(ii)(D)). This determination was made by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (that is, that are protective of human health and the environment and comply with all Federal and any more stringent State ARARs, or as appropriate, waive ARARs). Overall effectiveness was evaluated by assessing three of the five balancing criteria (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness) collectively. The relationship of the overall effectiveness of the Selected Remedy was determined to be proportional to its costs and hence represents a reasonable value for the money to be spent.

The estimated present worth cost of the selected remedy is the second lowest as compared to the other alternatives that were evaluated. The less expensive alternative had significant uncertainty as to whether it could reliably contain NAPL. The benefits of immobilizing the NAPL in the short-term outweigh the benefits of other costlier alternatives considered that would take longer to remove NAPL. In addition, there was significant uncertainty with the other alternatives considered on whether they could effectively remove all NAPL.

2.14.4 Utilization of Permanent Solutions to the Maximum Extent Practicable

The Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at this Site. The ISS technology is readily implemented and can be completed within a relatively short time period. The other alternatives considered would take a significant amount of time to remove NAPL and none of them would reduce NAPL and dissolved contaminant concentrations sufficiently that long term containment would not also be required.

2.14.5 Preference for Treatment as a Principal Element

The Selected Remedy treats the source materials constituting principal threats at the Site, achieving significant reduction in NAPL contamination at the sites. By utilizing treatment as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

2.14.6 Five-Year Review Requirements

Section 121(c) of CERCLA and the NCP §300.430(f)(5)(iii)(C) provides the statutory and legal basis for conducting five-year reviews. Because this remedy will result in hazardous substances remaining on-Site in soils and groundwater above levels that allow for unlimited use and unrestricted exposure, statutory reviews will continue to be conducted every five years to ensure that the remedy is, or will continue to be, protective of human health and the environment.

2019 Record of Decision Amendment

Part 3—Responsiveness Summary

Wyckoff/Eagle Harbor Superfund Site
Bainbridge Island, Washington

U.S. Environmental Protection Agency, Region 10

May 2019

Part 3—Responsiveness Summary

1.0 Overview and Background on Community Involvement

This responsiveness summary summarizes significant comments submitted by the public on the U.S. Environmental Protection Agency's (EPA) April 27, 2016 *Proposed Plan for Amending the Records of Decision for the Wyckoff/Eagle Harbor Superfund Site (Operable Units 1, 2, and 4)* (Proposed Plan; CH2M, 2016b) that are associated with the OU2/OU4 or Upland portion of the Wyckoff/Eagle Harbor Superfund Site (Site), and EPA's response to these comments. The Proposed Plan also included clean-up actions to address the OU1 intertidal beaches. A remedy for the OU1 intertidal beaches was issued in a separate May 2018 decision document (*Record of Decision Amendment Wyckoff/Eagle Harbor Superfund Site Operable Units 1, 2, and 4 Beaches and Perimeter Wall Bainbridge Island, Washington*, EPA, 2018). The May 2018 Record of Decision (ROD) Amendment (RODA) also included a decision to replace the Upland site access road and perimeter sheet pile wall. The new access road will support construction of the OU1 intertidal beach remedy and future construction of the OU2/OU4 Upland remedy. The new perimeter sheet pile wall will replace segments of the existing wall, which are deteriorating, and will also protect the OU1 intertidal beach and shoreline portions of the OU2/OU4 Upland remedy once constructed.

A responsiveness summary is required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at 40 Code of Federal Regulations (CFR) § 300.430(f)(3)(F). All relevant comments summarized in this document were considered in EPA's selection of a remedy to address nonaqueous phase liquid (NAPL) contamination present in the OU2 (subsurface soil) and OU4 (groundwater) portions of the Site's Upland area.

The EPA worked closely with the Washington State Department of Ecology (Ecology), Suquamish Tribe, City of Bainbridge Island (the City), and other stakeholders during development of the Focused Feasibility Studies (FFSs) for OU1 (CH2M, 2016a) and OU2/OU4 (CH2M, 2016c) and the Proposed Plan to address NAPL present at the Site. Community participation played a key role in the development of the Proposed Plan and this RODA.

From the time the Wyckoff/Eagle Harbor Superfund Site was added to the National Priorities List (NPL) in 1987, EPA has used a variety of outreach methods to promote stakeholder involvement. Enhanced public participation is appropriate due to the Site's complexity, geographic proximity to Puget Sound, a stakeholder who is a federally recognized Tribe with usual and accustomed fishing rights, and the Site's recognized potential as a future recreational area. Enhanced public participation has included periodic public meetings, quarterly interagency coordination calls, distribution of fact sheets and other outreach materials, postings at local gathering places and on the Washington State Ferries, email notifications, web page updates, and more. Leading up to the Proposed Plan, Ecology convened a small, local Community Interest Group which met quarterly to learn about clean-up alternatives development and to give informal input. EPA was very involved with this group, and coordinated with Ecology to deliver presentations at the meetings.

1.1 Activities before Issuing the Proposed Plan

A Notice of the availability of the Proposed Plan and associated documents was published in the Bainbridge Islander on April 22, 2016, along with notice of a public meeting held on April 27. Information about the Proposed Plan and public meeting was sent by email to 553 individuals who had previously signed up to receive project updates by email. A fact sheet summarizing the Proposed Plan and announcing the public meeting (EPA, 2016b) was mailed to 875 individuals on the Site's mailing list.

A Notice of the public meeting was advertised in the City's weekly community newsletter. Flyers informing the community about the public meeting were posted at the site and on community notice boards at the grocery store, the ferry terminal, local parks, the local library, and other high traffic locations. Bloomberg News ran a story about the Proposed Plan and public meeting on April 26, 2016.

1.2 Activities after Issuing the Proposed Plan

EPA held a public meeting on April 27, 2016 at the City's City Hall Council Chambers. About 50 people attended the meeting. The *Kitsap Sun* ran an article about the Proposed Plan on May 6, 2016. The public comment period for the Proposed Plan was held from April 25 until June 30, 2016. EPA extended the comment period from the 30 days required by the NCP to 60 days due to high community interest and a request from the public. The Proposed Plan, along with maps and other supporting documents, were posted on EPA's website (Soil and Groundwater Amended ROD Administrative Record). Hard copies and compact discs of the Proposed Plan, along with the OU1 FFS and the OU2/OU4 FFS, were made available at the Bainbridge Public Library, the local information repository.

2.0 Public Comments and U.S. Environmental Protection Agency Responses

This section summarizes comments received during the April 27, 2016, public meeting and during the April 25 through June 30, 2016, public comment period, along with EPA responses. Only those comments associated with EPA's preferred alternative for the OU2/OU4 - Upland area are included in this responsiveness summary. Comments and EPA responses associated with the OU1 intertidal beaches are provided in the May 2018 RODA. Most public comments received during the public meeting and public comment period were associated with the OU2/OU4 (Upland) preferred alternative.

Section 2.1 summarizes the comments and presents EPA's response to oral comments received during the April 27, 2016 public meeting while Section 2.2 provides a comment summary and EPA's response to written comments received during the public comment period. Table 3-1 provides a roadmap identifying the Responsiveness Summary subsection where specific comment summaries and responses are provided.

Table 3-1. Comment Response Roadmap

Comment Key Points and Response Categories	Section in Responsiveness Summary Where Addressed	EPA Comment Numbers
Oral Comments Received during April 27, 2016 Public Meeting (Section 2.1)		
Speaker 1: Supports Alternative 7	2.1.1	Oral Comment – Speaker 1
Speaker 2: Alternative 7 Deployment and Other Considerations	2.1.2	Oral Comment – Speaker 2
Speaker 3: Elimination of Contaminant Mass vs. Stabilization and Other Considerations	2.1.3	Oral Comment – Speaker 3
Written Comments Received from the Public on OU2/OU4 (Section 2.2)		
Groundwater Quality and Quantity	2.2.1	9
Supports Alternative 4	2.2.2	12, 13, 18, 19, 33, 35, 37, 38, 40, 42, 45
Supports Alternative 6 or Modified Alternative 6	2.2.3	10, 22, 26, 27, 28, 31, 32, 39, 41, 43, 46/47, 49, 50
Alternative 7 Deployment and Long-term Stability of ISS Columns	2.2.4	15, 17, 23, 24, #46
Opposed to ISS Technology	2.2.5	36
Other Technologies	2.2.6	6, 7, 16
Miscellaneous Topics	2.2.7	1, 2, 3, 5, 8/21, 11, 44

Comment Key Points and Response Categories	Section in Responsiveness Summary Where Addressed	EPA Comment Numbers
Comments Received from State, Tribal Nations, Local Government, and Community Organizations (Section 3)		
Washington State Department of Ecology (Section 3.1)	3.1	25
Washington State Historic Preservation Officer and Department of Archaeology & Historic Preservation (Section 3.2)	3.2	14
Washington State Department of Natural Resources (Section 3.3)	3.3	4
Squamish Tribe (Section 3.4)	3.4	48
City of Bainbridge Island (Section 3.5)	3.5	20
Bainbridge Island Parks Foundation (Section 3.6)	3.6	34
Association of Bainbridge Communities (Section 3.7)	3.7	30

2.1 Oral Comment Summaries and EPA Response

This section of the Responsiveness Summary presents excerpts from the April 27, 2016 public meeting transcript for the members of the public who provided comment during oral testimony and EPA's response to the comments. Three speakers provided comments.

2.1.1 Speaker 1: Supports Alternative 7

> *"So I'm really appreciative that the EPA is back on this to clean it up. It's been something like twelve or fifteen years since that steam experiment happened, and I always wondered when something else was going to happen. This plan seems very good. I spent my career in construction, and this seems like a very good plan and you have very good alternatives. Thank you very much."*

U.S. Environmental Protection Agency Response

EPA appreciates your support for Alternative 7. Based on public and stakeholder comments, key elements of Alternative 4 - In-situ Solidification/Stabilization and Alternative 7 - In-situ Solidification/Stabilization of Expanded Core Area and Thermal-Enhanced Recovery were merged to develop the Selected Remedy for the Upland area.

2.1.2 Speaker 2: Alternative 7 Deployment and Other Considerations[1]

Speaker 2 commented on several aspects of Alternative 7 and past cleanup that included the following:

1. EPA should reconsider the areas and volumes of material to be treated using in-situ solidification/stabilization (ISS) and should pair the ISS technology with other technologies that would remove some of this contamination.
2. There is uncertainty on the permanence and longevity of the ISS treated zone especially given the conditions (sea water, geologic, and marine hazards) present at the Wyckoff site.
3. ISS deployment may spread contamination into other areas
4. Future groundwater use

[1] Speaker 2 comments on 1) sheet pile wall effectiveness, and 2) West Beach clean-up and sampling frequency are addressed in the May 2018 RODA Responsiveness Summary

U.S. Environmental Protection Agency Response

EPA's response to the comment summaries presented above are provided in the corresponding numbered responses below.

1. **Areas and Volumes for ISS Treatment and Pairing of ISS with a Removal Technology.** During development of the Selected Remedy for the Upland, EPA re-evaluated the TarGOST investigation results as described in the *Supplement to the NAPL Focused Feasibility Study for OU2/OU4 – Wyckoff/Eagle Harbor Superfund Site, Bainbridge Island, WA* (CH2M, 2017) to refine the area and volume of NAPL contaminated material that will be treated using ISS. Based on this evaluation, the estimated volume of NAPL contaminated material that will be treated by ISS under the Selected Remedy is 267,000 cubic yards (CY) with a majority (236,000 CY) of the ISS treatment occurring in Phase 1. For comparison, Alternative 4 would have treated 325,000 CY and Alternative 7 would have treated 202,000 CY using ISS. The re-evaluation of the TarGOST investigation results also provides greater certainty that the ISS technology is being applied in the areas where the greatest NAPL concentrations occur.

The pairing of ISS with NAPL contaminated soil removal (excavation) and medium temperature thermal desorption (MTTD) treatment was not considered in the OU2/OU4 FFS because these two technologies are not considered complementary and would most likely have a higher combined cost due to the large equipment mobilization and high capital and operation costs associated with MTTD equipment.

2. **ISS Permanence and Longevity.** Please see Section 2.2.4 of this Responsiveness Summary for EPA's response to a similar comment.

3. **ISS Deployment May Spread Contamination to Other Areas.** The injection of the ISS reagent mix through the auger flights and jet grout nozzle may result in some pore fluid displacement and potential NAPL mobilization. This can be minimized by homogenizing the NAPL and soil first through the action of the augers and jet grout process before injecting. The existing hydraulic containment system, modified to shift well locations to non-ISS treated areas, will remain operational during ISS implementation to remove displaced NAPL and dissolved phase contaminants. ISS performed using the excavator mixing, which is an additional method to be used under the Selected Remedy, should not spread contamination.

4. **Future Groundwater Use.** EPA recognizes that future groundwater use in the upper and lower aquifers will have to managed through groundwater use restrictions that will remain in place until groundwater monitoring confirms that the water quality is commensurate with the intended use.

2.1.3 Speaker 3: Elimination of Contaminant Mass versus Solidification/Stabilization and Other Considerations[2]

Speaker 3 commented on multiple aspects of Alternative 7 that included the following:

1. Elimination of Contaminant Mass vs. Stabilization and Long-term Stability of the ISS Zone
2. Thermal Treatment to 20 feet
3. Use of Common Element funding to support Alternative 6

U.S. Environmental Protection Agency Response

EPA's response to comment summaries presented above is provided in the corresponding numbered responses below.

1. Please see EPA response to similar comment presented in Section 2.2.3 and 2.2.4.

2. Please see EPA response to similar comment presented in Section 2.2.3.

3. Please see response to similar comment presented in Section 2.2.3.

[2] Speaker 3 comments on West Beach are addressed in the May 2018 RODA Responsiveness Summary

2.2 OU2/OU4 Comment Summaries and EPA Responses

A number of comments received from the public were related to identification of Upland Alternative 7 - In-Situ Solidification/Stabilization of Core Area and Thermal-Enhanced Recovery as the preferred alternative. Many commenters voiced support for Upland Alternative 4 – In-Situ Solidification/Stabilization or Alternative 6 - Excavation, Thermal Desorption, and Thermal-Enhanced Extraction or a modified version of Alternative 6. The following sections present EPA's response to written public comments received during the public comment period.

2.2.1 Comment: Groundwater Quantity and Quality

One commenter (Comment #9) expressed concern that pumping from the existing Wyckoff water supply well and a local neighborhood well could affect the quantity of water available from other local private wells.

U.S. Environmental Protection Agency Response

The existing Wyckoff water supply well (Well 01-CT01), which is screened at a depth of 450-500 feet below ground surface, has been pumped sparingly since 2001. Groundwater from this well is pumped on an as-needed basis to support backwash of the groundwater treatment plant's (GWTP) granular activated carbon vessels. This use is estimated at several thousand gallons per week. The current hydraulic containment remedy requires seasonal pumping from 6 to 9 recovery wells that are screened in the upper aquifer at depths up to 70 feet at a total rate of 40 to 80 gallons per minute. Continuous water level monitoring performed in the upper and lower aquifers, to evaluate the effectiveness of hydraulic containment pumping, has not detected measurable water level drawdown on the neighborhood side of the Wyckoff site (south end) that can be attributed to hydraulic containment pumping. The water level fluctuations that are observed are the result of daily tidal cycles and natural seasonal fluctuations. EPA does not have information on what level of pumping is occurring at the local neighborhood well, which is most likely screened in the lower aquifer.

Future cleanup actions at the site will require continued pumping of the existing or replacement hydraulic containment wells for a period of time. Water from Well 01-CT01 will be required on an intermittent basis to support cleanup efforts (e.g. mixing of the ISS grout and GWTP operations).

EPA will continue to monitor water levels in the upper and lower aquifers as future cleanup actions are implemented to confirm no adverse offsite water level drawdown occurs.

2.2.2 Comment Summary: Supports Alternative 4

Several commenters expressed support for Alternative 4 over Alternative 7 with a number of reasons cited that included: a) similar costs (comment #12), b) shorter remedial action timeframe (comments #13, #19, #33, #35, #37), c) less community impacts (comment #18, #33), d) potential for a more visually appealing bulkhead (#13, #37), and e) no technical justification provided (#38, #40, #42, #45).

U.S. Environmental Protection Agency Response

Following review of public comments, EPA has merged key elements of Alternative 4 and Alternative 7 to develop the Selected Remedy. The Selected Remedy shares many Alternative 4 attributes including: a) treatment of a larger volume of material (267,000 CY) as shown on Figure 6 of the RODA, b) a shorter remedial action timeframe estimated at 11 years, c) less community impacts, and d) an upgradient cutoff wall (also on Figure 6) that in combination with the sheet pile wall fully encloses the NAPL contaminated zone similar to Alternative 4's ISS crust. The key benefit of the Selected Remedy, over the Preferred Alternative, is broader application of the ISS technology which has a much shorter design and construction timeline and requires no operations and maintenance (O&M). The NAPL recovery and thermal enhanced NAPL recovery technologies, which have been eliminated from the Selected Remedy, employed under Alternative 7 (the Preferred Alternative) would have required O&M periods of up to 5 years each.

The primary difference between the Alternative 4 and Alternative 7 bulkheads are their depths. Under Alternatives 4 and 7, and the Selected Remedy, the bulkhead's finished top elevation of 20 feet Mean Low-Low-Water and outer surface (facing the beach) would be visually similar to the existing sheet pile wall.

2.2.3 Comment Summary: Supports Alternative 6 or Modified Alternative 6

Several commenters expressed support for Alternative 6 – Excavation, Thermal Desorption, and Thermal Enhanced Extraction or a modified version of Alternative 6 that excavates and treats less soil, eliminates the thermal enhanced extraction component, and/or lessens the scope of Common Elements to reduce the total cost (Comment #32, #49). There were a number of reasons provided that included: a) the thermal destruction component that destroys contaminants (Comment #10, #22, #26, #27, #28, #31, #39, #43, #46/#47, #49, #50), b) uncertainty on the long-term stability and permanence of the ISS treated soil (Comment #22, #26, #28, #46/#47) especially given the Site's proximity to geologic (fault) and marine hazards (Comment #41, #46/#47), and c) less need to rely on sheet pile wall to contain treatment residuals (Comment #39).

U.S. Environmental Protection Agency Response

Alternative 6 would have used MTTD and Thermal Enhanced Extraction (TEE) to treat the NAPL source material. The degree of shoring and dewatering necessary to excavate NAPL-contaminated material at depths up to 55 feet below ground surface (bgs), was determined to be technically impracticable under Alternative 3. The excavation depth of 20 feet under Alternative 6 reflects what is technically and economically practicable for the conditions present in the Upland area. Alternative 6 utilizes the MTTD and TEE technologies to treat NAPL contaminated soil to the target depth of 20 feet. The combination of these two technologies, in combination with the shoring required to excavate to 20 feet, requires significant capital and MTTD and TEE operating costs. The approximate capital cost split between excavation/MTTD and TEE is $60 million and $40 million, respectively.

Several commenters (#32, #49) suggested reducing the depth of excavation from 20 feet to 15 feet to reduce costs. Even with the reduced excavation depth, shoring (sheet pile) would still be required to meet excavation dewatering and stability requirements. The shallower excavation depth (e.g. from 20 feet to 15 feet) might yield up to $5 million in cost savings but not much more since many of the costs are fixed and not necessarily reduced by treating a smaller volume of soil. Additionally, most of the NAPL is present at depths greater than 20 feet. Therefore, a shallower excavation would leave more NAPL behind requiring additional TEE treatment that would offset the excavation/MTTD cost savings.
It was also suggested that the cost of Alternative 6 could be reduced by not implementing the TEE phase. If the TEE phase is not conducted, the seasonal rise and fall of the upper aquifer water table, which reaches the ground surface in winter months, would re-contaminate the excavation and MTTD treated soils placed back into the excavation.

Several comments recommended utilizing enhanced aerobic biodegradation (EAB) in lieu of TEE for the deeper contamination. EAB is a polishing technology that will not remove NAPL and would not be effective for highly or even moderately contaminated areas. Treatment of a large quantity of NAPL with EAB will require an extremely long treatment duration, and associated O&M costs, and would not achieve the remedial action objectives.

Two commenters recommended removing several of the common elements to reduce the cost of Alternative 6. It should be noted that the common elements are necessary to implement all of the alternatives, therefore, if a common element is eliminated from Alternative 6 it should be removed from the cost of the other alternatives as well. Removal of debris and rock behind the existing sheet pile wall ($8.7 million) and installation of the replacement perimeter sheet pile wall/bulkhead ($13.3 million) account for about 50% of the total Common Element cost. EPA is evaluating an outside bulkhead alignment that may reduce or eliminate these costs, but again this cost savings would apply to all of the alternatives.

A recent wood treater contaminated soil and river sediment project utilized MTTD to treat creosote contaminated soil. Pieces of contaminated wood that passed through the rotary kiln prevented MTTD treated soils from achieving the treatment criteria. Wyckoff soils will likely have even more wood debris in the contaminated soils, so full treatment may require more than one pass through the MTTD treatment unit driving up costs above those estimated in the OU2/OU4 FFS.

MTTD operations also have a considerable amount of noise associated with equipment operation. If the kiln feed material has gravel and small cobbles, the noise from the rocks contacting the kiln's rotating steel walls is significant. Wyckoff soils contain gravel and cobbles, therefore, noise levels will be elevated. There are also large fans required to maintain vacuum on the treatment components. The fans and the movement of high volumes of air also result in high noise levels. ISS equipment operations are considerably less noisy than MTTD operations.

2.2.4 Comment Summary: Alternative 7 Deployment and Long-term ISS Monolith Stability

Several commenters asked about site logistics including use of Bainbridge Island roadways (Comment #15), the longevity of ISS (Comment #23), ability to take additional actions in the event ISS fails (Comment #15), and suitability of ISS for conditions present in the Upland (Comment #17, #24, #46).

U.S. Environmental Protection Agency Response

Site Access Logistics. Implementation of the Selected Remedy will require delivery of equipment and materials to the Site using existing roadways to the extent practical and by water when possible. The final design will identify both limits on existing road use to be protective of infrastructure and potential temporary and permanent means of water access.

ISS Permanence and Longevity. ISS is a well understood and extensively used remedial and soil strengthening technology. ISS is preferred because it treats the impacts by immobilizing contaminants in a soil-cement monolith thereby eliminating the separate NAPL. Removal of NAPL contaminated material from the Wyckoff site would transfer the impacts not destroy them. Additionally, removal would further stress fragile infrastructure requiring more than 23,000 truckloads or hundreds of barges to remove impacted soils and deliver clean backfill. The ISS process will eliminate separate phase creosote (NAPL) as part of the ISS mixing and curing process. While the chemical constituents will remain, the NAPL will not. Should ISS totally fail, a scenario that under any foreseeable condition is not likely, the NAPL would not be reformed and released. In the unlikely event portions of the monolith did completely fail, the constituents would be present within a solid phase matrix that could be excavated or be treated again using ISS. It should be noted that complete failure of an ISS treated area has not been observed on past projects, and is not expected given the knowledge and experience on how soil-cement monoliths behave in the subsurface environment.

Suitability for Wyckoff Upland Area. Each site where ISS is performed has its own characteristics. The design for each site must consider the site-specific conditions and this will be the case at Wyckoff. ISS has been used effectively on hundreds of sites, and has become the most widely used remedy for addressing NAPL at wood treating and similar coal tar impacted sites. ISS has been used to treat over 100,000 CY of impacts at former manufactured gas plant (MGP) sites in Massachusetts and Florida, and for a project close to 300,000 cubic yards in Illinois. A recent auger mix ISS project in New Jersey treated NAPL to a depth of 67 feet and at another project in New York, NAPL was treated to depths up to 47 feet.

The OU2/OU4 FFS indicated that productivity may be slower given the proposed depths at Wyckoff. The proper size ISS drilling equipment, auger diameter, and reagent slurry composition will be established during remedial design to ensure effective mixing based on the site conditions. The amount of mixing and amount of reagent added will be monitored at all depths to ensure complete mixing and quality control samples will be collected at varying depths to evaluate and document performance. ISS is routinely done under a range of groundwater depths, from very shallow to very deep. The presence and elevation of the water table is accounted for when establishing reagent slurry water addition rates to account for in-situ moisture conditions.

ISS has been completed in brackish conditions. Treatability testing will be evaluated using water with saline concentrations to match the site conditions and regents will be selected that can meet the performance criteria under the site-specific conditions. Recently, pilot testing was completed on the Gownaus Canal project in New York City, New York where brackish groundwater is present and several reagent mix designs were identified to meet the performance requirements.

ISS has been performed successfully since the 1980s. There is no long-term history for any remedial technology prior to the 1980, however, soil cement structures have been constructed for centuries and remain intact. The available long term data (Columbus GA) on ISS used as a remedial technology is very favorable, and after 10 years, the ISS mass continued to gain strength. The ISS monolith will be in ideal conditions as it is not exposed to the atmosphere, freeze/thaw or extensive wet/dry cycles (due to its low permeability). Under these conditions the monolith is expected to maintain its integrity for more than 100 years under the conditions currently present at the Wyckoff site.

2.2.5 Comment: Opposed to ISS Technology

One commenter (Comment #36) expressed support for a more permanent solution, not cement solidification. No preference for another alternative was given.

U.S. Environmental Protection Agency Response

The development, evaluation and identification of a preferred alternative for the Wyckoff Upland area was performed in accordance with the CERCLA RI/FS process, which included solicitation of public comment prior to selecting a final remedy. EPA appreciates your comment and considered this concern in development of the Selected Remedy.

2.2.6 Comment Summary: Other Technologies

Three commenters requested that alternative remedial technologies be considered. These technologies included Biochar (Comment #6), a biological cleanup solution offered by Fredrick Scheffler (Comment #7), and the Vadxx Energy Technology (Comment #16).

U.S. Environmental Protection Agency Response – Biochar Technology

Biochar is a natural or manmade product obtained from the thermochemical conversion of biomass in an oxygen-limited environment (http://www.bichar-international.org/biochar), and therefore, it is similar to the granular activated carbon (GAC) currently used in the Wyckoff groundwater treatment plant.

While the Biochar technology was not specifically evaluated as a remedial technology in the FFS, GAC as an enhancement to the ISS reagent mix was considered. Previous bench-scale testing has shown that the addition of GAC to the ISS reagent mix does not significantly decrease the leachability of NAPL constituents from the ISS monolith. Therefore, the addition of GAC does not warrant the additional cost. Due to their similar properties, adding biochar to the ISS reagent mix would likely produce results similar to GAC.

Mixing Biochar with subsurface NAPL contaminated soil could immobilize the NAPL, however, the mass of Biochar required would likely make it cost prohibitive. Additionally, it's unknown how the Biochar could be homogenized with the contaminated soil to obtain a uniform distribution.

U.S. Environmental Protection Agency Response – Biological Cleanup by Fredrick Scheffler

Mr. Scheffler did not provide comments on the Proposed Plan. However, in earlier correspondence with the agency, Mr. Scheffler provided information about a potential treatment technology under development that would use enzymes and microbes to treat the contaminants in place, making them easier to recover. EPA was unable to fully evaluate the technology because of insufficient information about the efficacy, implementability, and cost of the technology. In order for EPA to consider a technology in the Feasibility Study process at a Superfund site, information about cost and performance must be available, including documentation of the technology's performance in a publicly available formal report or in peer reviewed literature.

U.S. Environmental Protection Agency Response – Vadxx Technology
The Vadxx technology converts a variety of plastic waste into fuel oil. The ability of this technology to convert NAPL contaminated soil into fuel oil would have to be evaluated through a pilot test. If feasible, the NAPL contaminated soil would have to be excavated for use as a feed stock for this recycling process. Therefore, this technology would have to be paired with Alternative 5 or Alternative 6.

2.2.7 Comments: Miscellaneous Topics

There were a number of comments that touched on a wide variety of topics. These comments and EPA responses have been grouped into the miscellaneous category. The comment summaries and EPA responses presented in the following subsections are presented in chronological order corresponding to the date when the comment was received with the earliest comment presented first.

2.2.7.1 Comment: Paying for the Cleanup
One commenter (Comment #1) expressed a desire for Wyckoff dollars be used to pay for the cleanup

U.S. Environmental Protection Agency Response
EPA negotiated a settlement with the Wyckoff Company in August 1994. The agreement created the PSR Environmental Trust into which the heirs of the Wyckoff Company founders, owners and operators placed all ownership rights and shares in the Company to allow the Trust to maximize liquidation of all company assets, including nonwood-treating holdings, for the benefit of the environment. The beneficiaries of the Trust are the United States Department of Interior, National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce, and the Suquamish and Muckleshoot Tribes, as Natural Resource Trustees, as well as EPA (the Superfund trust fund) for reimbursement of CERCLA remedial costs. A memorandum of agreement was entered into by the beneficiaries of the Trust to ensure that settlement proceeds would be applied toward both environmental response and natural resource restoration goals (Record of Decision for OU2/OU4, EPA, 2000). The fraction of these funds available for cleanup have been exhausted.

As indicated in the Wyckoff Proposed Plan Frequently Asked Questions, distributed with the April 2016 Fact sheet, Federal and state taxpayers will pay for the cleanup project. Cleanup construction will be funded through a mix of 90% federal funds from the EPA Superfund program, and 10% state funds from the Washington Department of Ecology's Toxics Cleanup Program.

2.2.7.2 Comment: Vegetation Clearing
Several commenters (Comment #2, Comment #3, Comment #5) expressed a desire that the scotch broom be removed.

U.S. Environmental Protection Agency Response
EPA removed vegetation, including scotch broom, from the Wyckoff Upland area in fall 2017. Future vegetation clearing will be performed as necessary to support construction of the various elements of the selected remedy identified in this RODA.

2.2.7.3 Comment: Vendor Materials
One commenter (Comment #8, Comment #21) requested their steel pipe be used to support the cleanup effort.

U.S. Environmental Protection Agency Response
The materials required to construct the selected remedy will be identified in the drawings and specifications that are prepared during remedial design. At this time, EPA is unable to specify what materials will need to be used.

2.2.7.4 Comment: Future Site Development
One commenter (Comment #11) requested that the park, envisioned for the Wyckoff site once cleanup is complete, have walkways, bike paths, benches, tables, bathrooms, and access for disabled persons.

U.S. Environmental Protection Agency Response

The final cover to be constructed over the site, once cleanup is complete, will include grading and contouring and an erosion protection vegetation cover. Responsibility for the design, construction, and maintenance costs of the above ground portion of the park lies with the City of Bainbridge Island and the Agreed Order entered into between the Department of Ecology and the City of Bainbridge Island.

2.2.7.5 Comment: Varying Questions

One commenter (Comment #44) posed a variety of questions within a lengthy letter. The questions asked included the following:

1. What fumigants are used today by shippers?
2. What was the source of the creosote in OU3? Where exactly was it located? How deep? On which side of the ravine swale from Bill Point Hill?
3. How deep is the City well on Taylor Avenue that is close to OU3?
4. How deep is that well? How often is it tested?
5. How does it compare to EPA/DOE's newer well in Upper Beach area behind fence?
6. Does anyone know what bacteria would do naturally in that time? Does anyone know what the sea level will be in that time? Does anyone know if the United States or EPA will still be around in that time?
7. I am very apprehensive about the concrete slurry suggested remedy as it likely precludes other possible remedies such as may present themselves in today's rapidly changing world? Will a bacterial remedy be possible in a cracked or uncracked cement blob?
8. If this site can be cleaned up, will it be worth the expense to tax holders?
9. What is the cost to date? $150M? More? Less?

U.S. Environmental Protection Agency Response

EPA's response to each numbered question listed above is provided below.

1. A variety of fumigants are used today. The fumigant applied depends on the type of pest to be controlled, applicable federal, state and local regulations, and shipper, receiver specifications.
2. The creosote present in the OU3 sediments likely originated from migration of wood treating chemicals historically released at the Wyckoff site during its 80-year operational history. The distribution of creosote in OU3 is described in the *EPA Superfund Record of Decision: Wyckoff Co./Eagle Harbor EPA ID: WAD009248295 OU 03 Bainbridge Island, WA 09/29/1992* (EPA/ROD/R10-92/047) available at: https://semspub.epa.gov/work/10/500012853.pdf

   The Wyckoff site is located on the north side of Bill Point Drive.
3. EPA does not have construction information readily available for the Taylor Avenue well. EPA recommends researching the City of Bainbridge Island website for well construction information and contacting the City with further questions. Well information is available at: http://www.bainbridgewa.gov/faq.aspx?TID=15
4. EPA recommend contacting the City of Bainbridge Island after reviewing the information posted on the website listed above to identify water supply well testing schedules. EPA recommends contacting the City (Charles Krumheuer, ckrumheuer@bainbridgewa.gov) for questions about water supply testing.
5. The EPA well located on the Wyckoff site, which is identified as Well 01-CT01, is screened at a depth of 450 to 500 feet below ground surface. The nearest water supply wells according to the WA Department of Health website are called Bill Point Water System. They are about 1000 feet horizontal distance from the site. The five wells range in depth from 150 to 161 feet. Information on the wells can be found at this DOH website: https://fortress.wa.gov/doh/eh/portal/odw/si/singlesystemviews/SourceSingleSys.aspx

6. Bacteria that naturally degrade the dissolved phase contaminants present in groundwater at the Wyckoff site do so very slowly due to dissolved oxygen limitations and the slow rate of contaminant partitioning from NAPL to the groundwater. Enhanced aerobic biodegradation (EAB) was a component of several alternatives described in the Proposed Plan. This technology consists of injecting air and nutrients to stimulate bacterial degradation in the low contaminant concentration portions of the upper aquifer. In the high concentration areas, the mass of dissolved phase contaminants is too great for bacterial degradation to achieve cleanup within a reasonable timeframe.

   EPA has not performed sea level rise projections for the Wyckoff site. However, it is understood that any sea level rise that does occur would be partially or fully offset by a rising land surface attributed to movement along one or more of the fault zones present in the Pacific Northwest.

   EPA expects to be around as long as there is a need to protect human health and the environment.

7. No, a bacterial remedy within the ISS monolith will not be possible as the conditions required for bacterial growth and reproduction will be unfavorable. However, bacterial degradation within upper aquifer groundwater outside the ISS footprint will likely continue as an incidental component of the Selected Remedy.

8. Yes, all of the project stakeholders have indicated a strong preference for cleanup of the upland portion of the Wyckoff site such that it can be converted into a park for the benefit of the local community. The detailed and comparative evaluation of alternatives presented in the OU2/OU4 FFS also concluded that treatment of the NAPL present in soil and groundwater beneath the Upland area will provide increased protection for human health and the environment.

9. The total costs incurred by EPA at the site to date are approximately $192 million. This sum includes investigation and cleanup work across the entire site, including the former shipyard on the north side of the harbor, the former wood treating facility, and the harbor sediments. The Washington Department of Ecology's costs to date are approximately $6 million. This sum includes approximately $3 million for ongoing groundwater extraction and treatment costs.

3.0 Comments from the State, Tribes and Local Governments and Organizations

This section includes comment excerpts or comment summaries received from the State of Washington (Ecology, Washington State Historic Preservation Officer and Department of Archaeology & Historic Preservation, and Washington State Department of Natural Resources), the Squamish Tribe, local governments and offices (City of Bainbridge Island and Bainbridge Island Parks Foundation) and local community organizations (Association of Bainbridge Communities) and EPA's responses to the comments. Some of the comments are similar to those submitted and responded to in Section 2. Where this occurs, a cross reference is provided to the corresponding response in Section 2.

3.1 Washington State Department of Ecology

In their letter (Comment #25), Ecology expressed concurrence for the Upland preferred alternative identified in the Proposed Plan.

3.2 Washington State Historic Preservation Officer and Department of Archaeology and Historic Preservation

Representatives of the Washington State Department of Archaeology & Historic Preservation (DAHP) (Comment #14) requested that any surviving Wyckoff structures be documented using DAHP's WISAARD electronic database.

U.S. Environmental Protection Agency Response

The above ground portion of all original Wyckoff structures were demolished during early actions completed in the 1980s. Currently, there are no plans to document the below ground portion of these structures which

would be demolished and the material removed under the Common Elements portion of the Selected Remedy.

3.3 Washington State Department of Natural Resources

Representatives of the Department of Natural Resources (DNR) requested that the public comment period be extended (Comment #4) past May 31, 2016.

U.S. Environmental Protection Agency Response
EPA extended the public comment period to June 30, 2016 in a notification announced on May 16, 2016.

3.4 Squamish Tribe

In their letter (Comment #48), the Tribe generally expressed concurrence with the Upland preferred alternative identified in the Proposed Plan. Several clarifying questions related to implementation of the Upland preferred alternative and its associated common elements were asked as described below.

3.4.1 Comments: Implementation of the Upland Preferred Alternative and its Common Elements

"The Suquamish Tribe supports in-situ solidification/solidification (ISS) of the core area and thermal-enhanced recovery (Upland Alternative 7), and the remedial action objectives (RAOs) proposed for the Soil and Groundwater Operable Units. However, the Tribe does have concerns associated with this alternative and requests further discussion on several common upland elements.

The timeframe for completing actions and achieving the RAOs under Alternative 7 is a concern for the Tribe. This alternative proposes 10 years of active construction followed by an additional 24 years of activities to achieve the RAOs. The Tribe requests that EPA further evaluate the schedule of actions under this alternative to reduce the timeframe needed to achieve the RAOs.

The Tribe also request continued discussions on the alignment and construction of the new stormwater outfall and any passive discharge of gourndwater through the perimeter wall. The Tribe is concerned of water quality issues associated with these further discharges. It is important that the construction and discharge from the new stormwater outfall pipe avoids any potential impacts to shellfish growing area classifications within the Eagle Harbor area and to nearby eelgrass beds. The Tribe has spent well over a decade to upgrade the shellfish growing area classification of the Port Blakely and Tyee Shoal geoduck tracts to "Approved" for harvesting, and any negative impact to these impacts the Tribe's treaty-reserved right to harvest. The Tribe also participated as an Elliott Bay Trustee Council representative on efforts to complete the nearby Milwaukee Dock eelgrass restoration project and the protection of this area is paramount.

The Tribe is considering supporting Upland Alternative 4 (ISS treatment for most of the upland area) if Tribal issues are satisfactorily and meaningfully addressed. These issues include (1) the on-site placement of a significantly larger volume of ISS-treated soils onsite, and (2) the construction and transportation requirements for the treatment of 352,000 cubic yards of soil within a four-year construction period. A positive component of this alternative is the 12-year timeframe for completing actions required to achieve the RAOs."

U.S. Environmental Protection Agency Response
Timeframe to Achieve RAOs. By modifying the Upland Preferred Alternative to address public and stakeholder comments, the remedial action timeframe for the Selected Remedy has been shortened from an estimated 33 years to 11 years.

New Stormwater Outfall and Passive Groundwater Discharge. EPA will coordinate closely with the Tribe on the location of the new stormwater outfall and the passive groundwater discharge outlets during the

remedial design of these components. The water discharged from these structures will meet applicable discharge criteria specified in the NPDES permit.

Support for Alternative 4. Under the Selected Remedy described in this RODA, EPA will utilize the remedial design, including the tools and processes that are available during this phase of the project, to develop a detailed grading plan that accommodates ISS swell, supports installation of the final cover, provides for effective stormwater runon/runoff controls, and promotes future site reuse.

3.5 City of Bainbridge Island

"A number of citizens have shared with us their views of the EPA's Preferred Alternative 7, and of other alternatives, both those considered by the EPA and otherwise. For reasons contained in the public comment to you by environmental geochemist Janet Knox and renewable energy engineer Eric Moe, we are persuaded that Upland Alternative 4 is the approach that would best balance the goal of cleaning this site with other important interest of Bainbridge Islanders, including returning the site to public use at an earlier date, and minimizing the impact to the community by shortening the duration of the clean-up effort. We urge you to choose Upland Alternative 4 as EPA's preferred alternative.

As you move forward with your efforts at this site, whatever alternative is ultimately chosen, we trust EPA will make a major effort to mitigate the effects of its work on the local community. Such mitigation should reasonably include financial support for improvements for bicycle and pedestrian safety on Eagle Harbor Drive in consideration of the increased truck traffic attendant to the work. Relocation of the east driveway so that the eastern slope of Pritchard Park is better protected, and provision of ADA access just south of the containment area would also be reasonable mitigation efforts."

U.S. Environmental Protection Agency Response

As described in the RODA, the Selected Remedy for the Upland area is similar to Alternative 4 with the primary difference being a slightly lower volume of material treated (267,000 CY versus 325,000 CY), the use of excavator mixing methods to treat areas with shallow (less than 30 feet) NAPL occurrences, and implementation of ISS in two phases with 88 percent of all ISS treatment completed in Phase 1 and 12 percent in Phase 2. The Selected Remedy also includes an upgradient cutoff wall, that in combination with the sheet pile wall, fully encloses the NAPL contaminated area a feature that is similar to the ISS crust under Alternative 4.

During the remedial design and remedial action construction phases of the project, EPA will coordinate closely with its contractors to develop a transportation plan that minimizes trips along Eagle Harbor Drive. The use of Superfund cleanup financial resources for bicycle and pedestrian safety enhancements may not be allowable. However, EPA will work with the City of Bainbridge Island to identify state and/or federal grants for such projects. The pursuit of these grants, and if successful, implementation of the associated project(s) would be the responsibility of the City. Additionally, responsibility for implementing the provisions of the Americans with Disability Act would also lie with the City during the design and construction of the aboveground portion of the park.

As indicated in Part 2 of the RODA, a new access road to the Wyckoff Upland area will be designed and constructed. EPA will coordinate with its remedial design contractor and the City to assure that the road alignment and grade support the Upland area's future reuse as a park.

3.6 Bainbridge Island Parks Foundation

The Bainbridge Island Parks Foundation joins members of the community and the City of Bainbridge Island in supporting Alternative 4 of the EPA recommended cleanup options for the Wyckoff/Eagle Harbor Superfund site at Pritchard Park on Bainbridge Island.

As a nonprofit dedicated to enhancing our community by supporting a thriving system of parks, trails and open-space on Bainbridge Island, we feel that it is critical for the existing substantial contamination to be isolated from public contact at this park. The beaches at Pritchard Park are popular and the existing closure areas outside of the area contained by the sheetwall are still frequented by park visitors. Threats posed by earthquakes and increased precipitation due to climate change increase concerns. Since the Feasibility Study predicts that the completion period to be 10 years for Alternative 4 versus 24-34 years for the recommended Alternate 7, we support the former over the latter: so that the park may be safe and accessible for public use sooner. We also support Alternate 4 as it provides the opportunity for a concrete bulkhead with design options similar to the new Seattle seawall: more attractive visually and ecologically than a steel sheet wall. We support Alternate 4 for minimizing the negative traffic and noise impacts to the community.

Along with others in the community, we encourage the remedy to include mitigation for the traffic impacts of the cleanup, including the transportation/delivery of materials by barge, and Eagle Harbor Dr. improvements to accommodate pedestrians and bicyclists. We also encourage the redesign of the entry road to consider future use of the park so as to optimize community use of the eastern bluff of the park, and to provide eventual ADA and improved emergency access to the beach and point at Pritchard Park.

U.S. Environmental Protection Agency Response
Please see Section 3.5 for EPA response to similar comments received from the City of Bainbridge Island.

3.7 Association of Bainbridge Communities

Comment: Risk Analysis and Community Impacts
The Association of Bainbridge Communities (Comment # 30) requested the following:

1. A risk analysis to assess “the probability the chosen alternative would sustain some sort of failure, and what the consequences and repair would be”.
2. The 2009 CDC Report be updated.
3. The chosen alternative incorporates the following:
    a. A vibration device for advancing new sheet pile to minimize noise.
    b. Barges be used to transport materials and equipment to the site to minimize local traffic.
    c. The height of the new bulkhead be lowered or the beach sloped to produce a more natural shoreline appearance.
4. The cleanup be documented with words and photos to serve as a reminder that Superfund sites can be reclaimed and avoided by simple acts of prevention.
5. Inclusion of ABC and Pritchard Park Advisory Design Committee representatives in the entrance road and overall cleanup design.

U.S. Environmental Protection Agency Response
EPA response to the numbered comments above is provided by corresponding number below.

1. Although remedy failure is one of several subfactors identified under the CERCLA balancing criteria of long-term effectiveness and permanence (see Table 4-1 in the OU2/OU4 FFS), this concept is addressed during the remedial technology screening phase by eliminating technologies that carry a high level of performance uncertainty using the CERCLA screening criteria of effectiveness, implementability, and cost. By screening out technologies with greater performance uncertainty, the risk of remedy failure is reduced. Potential areas of performance uncertainty associated with the key technologies employed by the Selected Remedy, and how these uncertainties are addressed, include the following:

- **ISS Uncertainty.** Inability to advance augers to target depth due to the presence of buried debris. Based on the current understanding of the subsurface underlying the former process area, a majority of the debris lies within 7 feet of the ground surface.

  How Addressed. Under the Common Elements portion of the Selected Remedy, this material would be removed. In the event debris is encountered at depths below 7 feet, the ISS subcontractor will have a trackhoe excavator(s) onsite to remove this material. The Selected Remedy will also use excavator mixing to implement ISS in areas with shallow (less than 30 feet) NAPL occurrences. Excavator mixing methods will also be effective for treating areas with higher debris concentrations present at depths between 7 feet and 30 feet.

  This commenter expressed concern that auger penetration into the aquitard during ISS implementation could occur. EPA believes the potential for this will be very low. Based on the large number of wells drilled in this portion of the Site, there is a substantial geologic record. Aquitard depth information will be provided to the ISS equipment operator who will continuously monitor the auger depth as it is advanced.

2. The 2009 CDC Report has not been updated and a schedule for a future update has not been determined. As noted in the 2009 report, *"The West Beach and the Hillsides areas are safe for unlimited normal recreational activities such as hiking, running, digging, sunbathing, playing ball, etc. Care should be taken to ensure that children do not dig through the layer of rock/cobbles above the plastic sheeting recently placed below the beach surface by EPA. This layer separates clean sand from the contaminated soil/sediments below."*

   The 2009 report also notes: *"The current data indicate that swimming in Eagle Harbor does not present a health risk from chemical contaminants. "*

   Current site conditions are similar to those present in 2009, therefore, the CDC findings are still applicable. EPA also conducts five year reviews to evaluate current and future protectiveness at Superfunds sites where contaminants are present at levels that prevent unrestricted use/unrestricted exposure. The last five-year review (*Fourth Five-Year Review Report for Wyckoff/Eagle Harbor Superfund Site Kitsap County, Washington*, EPA, 2017), conducted in 2017, concluded that conditions at West Beach are protective.

3. Once EPA commences remedial design for the Upland Selected Remedy, the subcontract bid documents will likely indicate a preference for use of vibratory equipment to advance sheet pile during construction of the new bulkhead, and use of barges to transport large equipment and materials. The height of the bulkhead (top elevation currently estimated at 20 feet mean low-low water) will be controlled by geotechnical factors, and therefore, it may not be possible to lower it. However, once design for the bulkhead begins, EPA will hold public meetings to present conceptual designs and to seek input from the public on the final design.

4. Yes, implementation of the OU2/OU4 remedy will be documented in a construction completion report that will include a photographic and narrative chronology.

5. Yes, EPA plans on holding public meetings through the remedial design process to seek input from ABC, Pritchard Park Advisory Design Committee, and other stakeholder representatives.

Acronyms and Abbreviations

Acronyms and Abbreviations

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
ARAR	applicable or relevant and appropriate requirement
ASIL	Acceptable Source Impact Level
ATSDR	Agency for Toxic Substances and Disease Registry
BACT	best available control technology
BAT	best available technology economically achievable
BCT	best conventional pollutant control technology
bgs	below ground surface
BMP	best management practice
BPJ	best professional judgment
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CH2M	CH2M HILL Engineers, Inc.
City	City of Bainbridge Island
COC	contaminant of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSL	cleanup screening level
CUL	cleanup level
CWA	Clean Water Act
CY	cubic yard(s)
DAHP	Washington State Department of Archaeology and Historic Preservation
DNAPL	dense nonaqueous-phase liquid
DNR	Washington State Department of Natural Resources
DOH	Washington Department of Health
EAB	enhanced aerobic biodegradation
EBS	exposure barrier system
Ecology	Washington State Department of Ecology
EFH	Essential Fish Habitat
ELCR	excess lifetime cancer risk
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FFS	focused feasibility study
FPA	Former Process Area, the 11-acre area where wood treating operations took place at the Wyckoff wood treating facility
FS	feasibility study
GAC	granular-activated carbon
gpm	gallons per minute
GWTP	groundwater treatment plant
HDPE	high-density polyethylene

HDR	HDR Engineering, Inc.
HMR	Hazardous Materials Regulations
HMTA	Hazardous Materials Transportation Act
HPAH	high molecular weight polycyclic aromatic hydrocarbon
HQ	health quotient
IC	institutional control
ID	identification
ISCO	in-site chemical oxidation
ISS	in-situ soil solidification/stabilization
LDR	Land Disposal Restriction
LIF	Laser Induced Fluorescence
LNAPL	light nonaqueous-phase liquid
MLLW	mean lower low water
MNR	monitored natural recovery
MOU	memorandum of understanding
MTCA	(Washington) Model Toxics Control Act
MTTD	medium temperature thermal desorption
NAPL	nonaqueous-phase liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPV	net present value
NRHP	National Register of Historic Places
O&M	operation and maintenance
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PCP	pentachlorophenol
PQL	practical quantitation limit
PR	Pacific Sound Resources
Proposed Plan	Proposed Plan for Amending the Records of Decision for the Wyckoff/Eagle Harbor Superfund Site (Operable Units 1, 2, and 4)
PSCAA	Puget Sound Clean Air Agency
PSR	Pacific Sound Resources
RAO	Remedial Action Objective
RBTC	risk-based threshold concentration
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RI	Remedial Investigation
ROD	Record of Decision
RODA	Record of Decision Amendment
SCO	Sediment Cleanup Objective
SEE	Science and Engineering for the Environment, LLC
SHPO	State Historic Preservation Officer
Site	Wyckoff/Eagle Harbor Superfund Site

SMP	Shoreline Master Program
SMS	State of Washington Sediment Management Standards
TarGOST	Tar-specific Green Optical Scanning Technology
TDS	total dissolved solids
TEQ	toxicity equivalent
U.S.	United States
UCL95	upper confidence limit on the mean
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
WAC	Washington Administrative Code
WISAARD	Washington Information System for Architectural and Archaeological Records Data

Works Cited

Works Cited

Aero-Metric, Inc. 2010. *Eagle Harbor Task Order #20 Summary Report*. Prepared for the U.S. Army Corps of Engineers – Seattle District. August 10.

Agency for Toxic Substances and Disease Registry (ATSDR). 2009. *Health Consultation: Wyckoff/Eagle Harbor Superfund Site, Bainbridge Island, Kitsap County, Washington*. EPA Facility ID WAD009248295. Available at https://semspub.epa.gov/work/10/500009829.pdf. U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (ATSDR). July 22.

Brooks, Rich. 2016. Personal communication from Rich Brooks/Suquamish Tribe Fisheries Department, Environmental Program Manager to Helen Bottcher/U.S. Environmental Protection Agency, Office of Environmental Cleanup, Remedial Project Manager. April 5.

CH2M HILL Engineers, Inc. (CH2M). 1989. *Final Remedial Investigation Report for Eagle Harbor Site, Kitsap County, Washington*. Contract No. 68- 01-7251. Prepared for U.S. Environmental Protection Agency, Region 10, Hazardous Site Control Division, Seattle, Washington.

CH2M HILL Engineers, Inc. (CH2M). 1991. *Revised Risk Assessment, Eagle Harbor Operable Unit, Wyckoff/Eagle Harbor Superfund Site*. Prepared for U.S. Environmental Protection Agency, Region 10. May.

CH2M HILL Engineers, Inc. (CH2M). 1994. *Final Focused RI/FS for the Groundwater Operable Unit for the Wyckoff/Eagle Harbor Superfund Site, Bainbridge Island, Washington*. Prepared for U.S. Environmental Protection Agency, Region 10, Seattle, Washington. July 13.

CH2M HILL Engineers, Inc. (CH2M). 1997. *Remedial Investigation Report for the Wyckoff Soil and Groundwater Operable Units, Wyckoff/Eagle Harbor Superfund Site, Bainbridge Island, Washington*. Prepared for U.S. Environmental Protection Agency, Region 10, Seattle, Washington. June 13.

CH2M HILL Engineers, Inc. (CH2M). 2013. *2012 Field Investigation Technical Memorandum Wyckoff OU1 Focused Feasibility Study*. Prepared for U.S. Environmental Protection Agency, Region 10, Seattle, Washington. February 20.

CH2M HILL Engineers, Inc. (CH2M). 2014a. *2014 Conceptual site Model Update for OU2 and OU4 Former Process Area*. Prepared for U.S. Environmental Protection Agency Region 10. February.

CH2M HILL Engineers, Inc. (CH2M). 2014b. *Wyckoff Groundwater Operable Unit—Upper Aquifer May 2014 Groundwater Sampling Results*. Draft Final Technical Memorandum. Prepared for U.S. Environmental Protection Agency Region 10. April 4.

CH2M HILL Engineers, Inc. (CH2M). 2015. *Non-Aqueous Phase Liquid Focused Feasibility Study for the Soil and Groundwater Operable Units (OU2/OU4) Wyckoff/Eagle Harbor Superfund Site, Bainbridge Island, WA*. Prepared for U.S. Environmental Protection Agency, Region 10, Seattle, Washington. November.

CH2M HILL Engineers, Inc. (CH2M). 2016a. *Focused Feasibility Study Wyckoff/Eagle Harbor Superfund Site Operable Unit 1*. Prepared for U.S. Environmental Protection Agency, Region 10.

CH2M HILL Engineers, Inc. (CH2M). 2016b. *Non-Aqueous Phase Liquid Focused Feasibility Study for the Soil and Groundwater Operable Units (OU2/OU4) Wyckoff/Eagle Harbor Superfund Site, Bainbridge Island, WA.* Prepared for U.S. Environmental Protection Agency, Region 10, Seattle, Washington. April.

CH2M HILL Engineers, Inc. (CH2M). 2017. *Supplement to the NAPL Focused Feasibility Study for OU2/OU4 – Wyckoff/Eagle Harbor Superfund Site, Bainbridge Island, WA*. Prepared for U.S. Environmental Protection Agency, Region 10, Seattle, Washington. August 23.

CH2M HILL Engineers, Inc. (CH2M). 2019. *Lower Aquifer Groundwater Quality Sampling Results for Wyckoff/Eagle Harbor Superfund Site—May 2018. Final Technical Memorandum*. Prepared for U.S. Environmental Protection Agency, Region 10, Seattle, Washington. March 28.

HDR Engineering, Inc. (HDR) 2012. *2011 Year 17 Monitoring Report, East Harbor Operable Unit, Wyckoff/Eagle Harbor Superfund Site*. Prepared for U.S. Environmental Protection Agency, Region 10 and U.S. Army Corps of Engineers –Seattle District. September 7.

HDR Engineering, Inc. (HDR). 2017. *Final 2016 Year 22 Monitoring Report, East Harbor Operable Unit, Wyckoff/Eagle Harbor Superfund Site*. Prepared for U.S. Environmental Protection Agency Region 10 and U.S. Army Corps of Engineers –Seattle District. September 29.

HDR Engineering, Inc. and Science and Engineering for the Environment, LLC (HDR and SEE). 2011. *Revised Final 2011 Operations, Maintenance, and Monitoring Plan Addendum, Wyckoff/Eagle Harbor Superfund Site, East Harbor Operable Unit*. Prepared for U.S. Environmental Protection Agency, Region 10, and U.S. Army Corps of Engineers, Seattle District.

HDR Engineering, Inc., Science and Engineering for the Environment, LLC, and Ken Taylor Associates, Inc. (HDR et al.) 2012. *FINAL 2011 Year 17 Monitoring Report, East Harbor Operable Unit, Wyckoff/Eagle Harbor Superfund Site*. Prepared for U.S. Environmental Protection Agency, Region 10 and U.S. Army Corps of Engineers –Seattle District. September 7.

Lewarch, pers. comm., 2016. Personal communication from Rich Brooks, Environmental Program Manager, Suquamish Tribe Fisheries Department, transmitting comments of Dennis Lewarch, Tribal Historic Preservation Officer, to Helen Bottcher, U.S. Environmental Protection Agency, Office of Environmental Cleanup, Remedial Project Manager. April 5.

Pritchard Park Advisory Design Committee (PPDAC). 2008. *Recommended Design for Pritchard Park*. Pritchard Park Design Advisory Committee with support from the Department of Urban Design and Planning, University of Washington. Presented to the City of Bainbridge Island and Bainbridge Island Metro Park & Recreations District. March 5.

U.S. Army Corps of Engineers (USACE). 2015. *Clam Tissue Collection Report. Wyckoff/Eagle Harbor Superfund Site*. U.S. Environmental Protection Agency Region 10. April 23.

U.S. Army Corps of Engineers (USACE). 2017a. *Fourth Five-Year Review Report for Wyckoff/Eagle Harbor Superfund Site, Kitsap County, Washington*. Prepared for U.S. Environmental Protection Agency, Region 10. Available at https://semspub.epa.gov/work/10/100068034.pdf. September 26.

U.S. Army Corps of Engineers (USACE). USACE. 2017b. *Final Clam Tissue Collection and Characterization Report. Wyckoff/Eagle Harbor Superfund Site*. U.S. Environmental Protection Agency Region 10. April 21.

U.S. Environmental Protection Agency (EPA). 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. Office of Emergency and Remedial Response. EPA/540/G-89/004. October.

U.S. Environmental Protection Agency (EPA). 1992*. Superfund Record of Decision: Wyckoff Co./Eagle Harbor EPA ID: WAD009248295, OU 03 Bainbridge Island, WA September 29.* EPA/ROD/R10-92/047. September 29.

U.S. Environmental Protection Agency (EPA). 1994a. *Interim Record of Decision Amendment, Wyckoff Groundwater Operable Unit, Wyckoff/Eagle Harbor Superfund Site*. September 30.

U.S. Environmental Protection Agency (EPA). 1994b. *East Harbor Operable Wyckoff Co./Eagle Harbor Superfund Site, Record of Decision*. EPA ID: WAD009248295, OU 01, Bainbridge Island, WA. Available at https://semspub.epa.gov/src/document/10/1258905. September 29.

U.S. Environmental Protection Agency (EPA). 1995a. *Amended Record of Decision, Decision Summary, and Responsiveness Summary for West Harbor Operable Unit, Wyckoff/Eagle Harbor Superfund Site, Bainbridge Island, Kitsap County, Washington*. December 8.

U.S. Environmental Protection Agency (EPA). 1995b. *Combined Sewer Overflows: Guidance for Nine Minimum Controls*. EPA 832-B-95-003. Available at http://water.epa.gov/polwaste/npdes/cso/Nine-Minimum-Controls.cfm. Environmental Protection Agency, Office of Water (4204). May.

U.S. Environmental Protection Agency (EPA). 2000a. *Wyckoff/Eagle Harbor Superfund Site Soil and Groundwater Operable Units, Bainbridge Island, Washington, Record of Decision.* EPA ID: WAD009248295. September 14.

U.S. Environmental Protection Agency (EPA). 2000b. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*. EPA 540-R-00-002 OSWER 9355.0-75. Prepared by U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers. Available at https://semspub.epa.gov/work/HQ/174890.pdf. July.

U.S. Environmental Protection Agency (EPA). 2002. *Role of Background in the CERCLA Cleanup Program*. OSWER 9285.6-07P. Available at https://www.epa.gov/sites/production/files/2015-11/documents/bkgpol_jan01.pdf. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Office of Emergency and Remedial Response. April 26.

U.S. Environmental Protection Agency (EPA). 2007. *Explanation of Significant Differences Wyckoff/Eagle Harbor Superfund Site, East Harbor Operable Unit*. September.

U.S. Environmental Protection Agency (EPA). 2009. *Region 10 Clean and Green Policy*. Available at https://www.epa.gov/greenercleanups/region-10-clean-and-green-policy.

U.S. Environmental Protection Agency (EPA). 2010. *Superfund Green Remediation Strategy*. Available at https://www.epa.gov/greenercleanups/superfund-green-remediation-strategy. September.

U.S. Environmental Protection Agency (EPA). 2013. *Support Document for Sole Source Aquifer Designation of the Bainbridge Island Aquifer System*. EPA 910-R-13-003. March.

U.S. Environmental Protection Agency (EPA). 2016a. *Proposed Plan for Amending the Records of Decision for the Wyckoff/Eagle Harbor Superfund Site (Operable Units 1, 2, and 4)*. Available at https://semspub.epa.gov/work/10/100010449.pdf. April.

U.S. Environmental Protection Agency (EPA). 2016b. *Important Public Comment Opportunity: Wyckoff/Eagle Harbor Superfund Site: EPA Proposes Additional Cleanup Action*. Available at https://semspub.epa.gov/work/10/100010260.pdf. April.

U.S. Environmental Protection Agency (EPA). 2017. *Toxicological Review of Benzo(a)pyrene*. Integrated Risk Information System, National Center for Environmental Assessment, Office of Research and Development, U.S. Environmental Protection Agency. EPA/635/R-17/003F. January.

U.S. Environmental Protection Agency (EPA). 2018a. *Record of Decision Amendment, Wyckoff/Eagle Harbor Superfund Site; Operable Units 1, 2 and 4; Beaches and Perimeter Wall, Bainbridge Island, Washington*. May.

U.S. Environmental Protection Agency (EPA). 2018b. *Calculation of Residual Risk Estimates and Risk-Based Cleanup Goals for the Wyckoff Superfund Site.* Memorandum prepared for Helen Bottcher, Remedial Project Manager, Office of Environmental Cleanup and prepared by Elizabeth Allen, Regional Toxicologist, U.S. Environmental Protection Agency, Region 10, Office of Environmental Assessment. April 16.

U.S. Environmental Protection Agency (EPA). 2019. Regional Screening Levels (RSLs) Generic Tables: Resident Soil, TR=1E-06, THQ =1.0. Accessed April 18, 2019 from https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

Washington State Department of Ecology (Ecology). 2015a. *Cleanup Levels and Risk Calculation (CLARC) Data Tables: Soil – Method B and Groundwater Protection (unrestricted land use)*. Available at https://fortress.wa.gov/ecy/clarc/FocusSheets/Soil%20Methods%20B%20and%20A%20unrestricted.pdf. Accessed April 26, 2019. July.

Washington State Department of Ecology (Ecology). 2015b. *Sediment Cleanup User's Manual II: Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards, Chapter 173-204 WAC.* Publication No. 12-09-057. Revised December 2017. Available at https://fortress.wa.gov/ecy/publications/documents/1209057.pdf. March.

Washington State Department of Ecology (Ecology). 2019. *Aromatic Hydrocarbons and Benzo[a]pyrene: Change to MTCA Default cleanup Levels for 2017*. Draft Publication Number 01-09-043. April.

Appendix 2A
Washington State Department of Ecology Concurrence Letter

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

April 24 2019

Chris Hladick, Region 10 Administrator
U.S. Environmental Protection Agency
1200 6th Avenue Suite 900
Seattle, WA 98101

Re: Interim Record of Decision Amendment Part II for the Wyckoff/Eagle Harbor Superfund Site, Bainbridge Island, Washington

Dear Chris Hladick:

The Department of Ecology (Ecology) is sending this letter as our formal concurrence to the United States Environmental Protection Agency's (EPA) Interim Record of Decision Amendment (RODA) Part II for the Wyckoff Eagle Harbor Superfund Site (Site).

Ecology appreciates EPA's effort to address the significant contamination remaining in the upland portion of the Site. This persistent source of contamination contributes to the migration of creosote oil to nearby sediment, and groundwater aquifers. The 2000 Record of Decision (ROD) for Soil and Groundwater Operable Units cludes steam enhanced injection and a contingency remedy (hydraulic containment).

In 2002 and 2003, EPA conducted a pilot scale study for the core remedial action removal/ treatment for soil and groundwater using the steam enhanced injection system), which encountered technical issues. As a result, it was determined that cleanup goals couldn't be met in a reasonable timeframe using the remedy proposed under the 2000 ROD.

The current upland remedy in operation is the contingency, Hydraulic Containment, consisting of a Groundwater Extraction and Treatment system (GETS), a failing sheet pile wall, and continuous monitoring. Based on the current estimate of residual creosote oil remaining upland, approximately 300 years of additional GETS ration would be needed to meet cleanup goals, and the estimated costs would mount to over $200 million, at non-discounted present value.

It is Ecology's understanding that the interim RODA Part II for the Site's upland would supersede the 2000 ROD. This includes a new remedy treating 267,000 cubic yards of creosote oil contaminated soil and groundwater through in-situ soil solidification/stabilization, a cutoff wall, capping, new perimeter wall, and permanent passive discharge/treatment drains. Less time will be needed to treat and stabilize the significant amount of creosote source materials in upland soil and groundwater.

The remedial actions, and a new permanent perimeter wall will improve current site conditions. For these reasons, Ecology concurs with selected remedy described in interim RODA Part II.

Ecology understands EPA's declaration that the current selected remedy would not meet Model Toxics Control Act/Sediment Management Standard's (MTCA/SMS) requirements by not addressing the lower aquifer. As a result, EPA and Ecology have determined that an Interim RODA is the appropriate path forward at this time.

Ecology is currently paying approximately $800,000 per year to operate the GETS at this site. Ecology also would appreciate EPA moving the remedy construction forward as scheduled. EPA will need to have hydraulic control at the site to implement the remedy. When this occurs, Ecology's position is that EPA will have to pay for the operation and maintenance (O&M) of the GETS, since it is a part of the remedy, or EPA will credit Ecology the amount required for Ecology to operate the treatment system to our 10% cost share for the remedy overall.

Ecology appreciates EPA's commitment to conduct performance and compliance monitoring of discharging groundwater quality from upper and lower aquifer groundwater conditions. This information will let us evaluate the O&M cost of the passive discharge/treatment system during the implementation of the remedies planned under this interim RODA II. The monitoring information will allow both parties to make a final decision on the contaminated groundwater in the lower aquifer.

Ecology acknowledges the need for additional work in OU2/4 described in interim RODA, and looks forward to the future final Record of Decision, to address the lower aquifer groundwater contamination.

Thank you for your staff's continued contributions throughout the cleanup process. If you have any questions please contact the Toxics Cleanup Program, Section Manager, Barry Rogowski at (360) 407-7226 or barry.rogowski@ecy.wa.gov.

Sincerely,

Angie C. Wirkkala (acting)

James J. Pendowski, Program Manager
Toxics Cleanup Program

Angie C. Wirkkala

cc: Chairman Leonard Forsman, Suquamish Tribe
Richard Brooks, Suquamish Tribe
Terry Lande, Bainbridge Island Metro Park & Recreation District
Tom Laurie, Ecology
Denise Clifford, Ecology

Appendix 3A
Redacted Comment Letters

Bottcher, Helen

From: Skadowski, Suzanne
Sent: Monday, April 25, 2016 2:20 PM
To: wyckoffcomments
Cc: Bottcher, Helen; Sherbina, Debra
Subject: Public Comment .... FW: Wyckoff clean up -Bainbridge

---

From: (b) (6)
Sent: Monday, April 25, 2016 2:16 PM
To: Skadowski, Suzanne <Skadowski.Suzanne@epa.gov>
Subject: Wyckoff clean up -Bainbridge

I want to thank the staff at the EPA for the endless work you do (regretfully with significant opposition from companies that knowingly poison the world we live in....and well as uneducated general public) I believe your work to be among the most important - if not THE most important work there is.

My public comment with regard to Wyckoff clean up in Bainbridge: Wyckoff knowingly polluted our water,air and land here below us in West Seattle. I regard Wyckoff as grossly negligent and irresponsible. They should pay - for generations - WYCKOFF DOLLARS ! - for the harm they have done to our water, air and land. They can destroyed the health and well being of wildlife, humans and the planet.

I am sooooooooo angry !

Wyckoff: clean it up and pay for it !!

(b) (6)
Admiral District, West Seattle

Bottcher, Helen

From: (b) (6)
Sent: Thursday, May 12, 2016 12:51 PM
To: wyckoffcomments
Cc: (b) (6)
Subject: Scotch broom
Attachments: PastedGraphic-1.pdf; ATT00001.htm; PastedGraphic-2.pdf; ATT00002.htm

Dear clean-up site:
We hope you will get rid of the Scotch broom!!

Warmest regards, (b) (6) SAVE THIS DATE: SAT. JUNE 4, 1 to 3, to join the goats at Blakely.

For more information call (b) (6) .

Bottcher, Helen

From: COTHERN, SHAYNE (DNR) <SHAYNE.COTHERN@dnr.wa.gov>
Sent: Thursday, May 19, 2016 9:46 AM
To: wyckoffcomments; Bottcher, Helen
Subject: FW: EPA Seeks Public Input on Cleanup Plans for Wyckoff-Eagle Harbor Superfund Site, Bainbridge Is., WA

Helen,

We at DNR wish to comment and I am leading effort but I was wondering if I could get an extension on this comment period? The cleanup is extensive and with eelgrass issues I was hoping to receive input from Jeff Gaeckle who is currently out doing field work on Milwaukee Dock and other similar projects.

I was hoping for a mid-June deadline but at minimum an additional week would be most appreciated.

Let me know and I will plan accordingly. Call if any questions.

Thank you so much,

Shayne Cothern
DNR-Environmental Specialist
(360) 902-1064

From: Suzanne Skadowski [mailto:PRAdmin@Vocus.com]
Sent: Monday, April 25, 2016 11:35 AM
To: COTHERN, SHAYNE (DNR) <SHAYNE.COTHERN@dnr.wa.gov>
Subject: EPA Seeks Public Input on Cleanup Plans for Wyckoff-Eagle Harbor Superfund Site, Bainbridge Is., WA

Media Contact: Suzanne Skadowski, 206-553-2160, skadowski.suzanne@epa.gov

EPA Seeks Public Input on Cleanup Plans for the Wyckoff-Eagle Harbor Superfund Site on Bainbridge Island, Wash.

Public Invited to Community Meeting on April 27, Comments on Cleanup Plan Due by May 31

(Seattle – April 25, 2016) The U.S. Environmental Protection Agency has proposed a draft plan to clean up toxic creosote contamination the Wyckoff-Eagle Harbor Superfund Site, located on the east side of Bainbridge Island, Washington. The cleanup plans will address historic creosote and related chemical contamination that remains in the site's groundwater, soil, and beach. EPA is hosting a public meeting this week and will be accepting public comments on the cleanup plans until May 31.

Public Meeting

April 27, 2016: City Hall Council Chambers, 280 Madison Ave., Bainbridge Island, Wash.

5:00 – 6:30 p.m. Informal Open House and Poster Session: The EPA's project team will be available to answer questions along with state Department of Ecology officials.

6:30 – 9:30 p.m. Presentation and Public Hearing: EPA's project manager will present the proposed cleanup plan and take verbal and written public comments.

History

EPA added the Wyckoff-Eagle Harbor site to the national Superfund cleanup list in 1987 after finding creosote and other toxic wood-treating chemicals in soil, groundwater, beaches and sediment in Eagle Harbor. EPA completed multiple clean up actions over the years, but significant contamination still remains in the soil and groundwater. The site's groundwater extraction system and perimeter wall are preventing contaminants from moving into Eagle Harbor. These measures are effective but expensive, costing about $800,000 to operate each year and may take more than 100 years to meet cleanup goals. Creosote also remains in the beaches, which are closed to shellfish harvesting, and warning signs are in place to discourage beach use.

Proposed Cleanup

To address soil and groundwater contamination at the former Wyckoff wood treating facility, EPA will use a combination of cleanup technologies. Cement and other reagents will be mixed into the most heavily contaminated soil more than 50 feet below ground to prevent the contamination from moving any further. In less contaminated areas, contaminants will be extracted with new groundwater wells, and air and nutrients will be injected to speed the natural breakdown of contaminants by bacteria. Finally, a thick layer of clean soil will be placed over the soil and a new concrete perimeter wall will be built next to the existing metal wall. In the adjacent beaches, EPA will remove contaminated sediments to a depth of 30 inches and backfill with a clean sand cap designed to prevent contaminants from coming up to the beach surface. The proposed cleanup will take at least 10 years to design and build and will cost an estimated $71 to $81 million, paid for by 90 percent federal and 10 percent state funding. When cleanup is completed, the site will be incorporated into Pritchard Park.

More Information

Public comments on the proposed cleanup plan are due by May 31, 2016, to: Helen Bottcher, Project Manager; U.S. EPA Region 10 (ECL-122); 1200 6th Ave.; Seattle, WA 98101 or wyckoffcomments@epa.gov.

The cleanup plan and supporting documents are also available at the Bainbridge Public Library, 1270 Madison Ave., Bainbridge Island, WA, (206) 842-4162, and at EPA's Superfund Records Center, 1200 6th Ave., Seattle, WA, (206) 553-4494 or (800) 424-4372.

The draft cleanup plan and feasibility studies are available online at: www.epa.gov/superfund/wyckoff-eagle-harbor.

# # #

Bottcher, Helen

From: (b) (6)
Sent: Friday, May 20, 2016 7:25 AM
To: wyckoffcomments
Subject: Superfund site
Attachments: PastedGraphic-2.pdf; ATT00001.htm

Hi
As (b) (6) of Weed Warriors, and instigator of many Earth Day events at Pritchard Park, I would like to have the entire Pritchard Park open. I look forward to the Point being available to the public. Ultimately, please get rid of the invasive plants, especially Scotch broom, and replace with hardy natives.

Warmest regards, (b) (6)

(b) (6)

Nonresponsive

For more information call (b) (6)

Bottcher, Helen

From: (b) (6)
Sent: Friday, May 20, 2016 7:45 AM
To: wyckoffcomments
Subject: biochar

Gardeners are now beginning to use a product called "biochar" which can remove contamination from pesticides and other toxic materials from the soil as well as making it more able to control runoff, etc. Basically, it's much like charcoal that naturally occurs after forest fires and can be seen in soil deposits from eons ago. I would doubt it would be able to handle Wycofff, but thought I would mention it as another useful tool.. well maybe, since I just read about it and don't know much beyond that.

Google "biochar" for a great explanation.

(b) (6)

Bottcher, Helen

From: (b) (6)
Sent: Wednesday, May 25, 2016 8:55 AM
To: wyckoffcomments
Cc: (b) (6)

I object to this proposal
Burying the problem is not a solution.
Adding soil on top of the site will increase pressure on the contaminants and water table and force the contaminants to migrate to the south and west.

The EPA needs to adopt the biological cleanup solution offered by (b) (6)

It is proven, cheaper, faster and offers a real cleanup solution

(b) (6)
Bainbridge, WA 98110
(b) (6)

Bottcher, Helen

From: Liz zhang <lizgreatpipe@163.com>
Sent: Thursday, May 26, 2016 5:38 AM
To: johns@sjr.com; vickiew@sjr.com; dariusm@sjr.com; publicrelations@takreer.com; customerservice@clmt.com; fabio.ceccarani@lyondellbasell.com; akadi@qalaaholdings.com; smurphy@qalaaholdings.com; ghammouda@qalaaholdings.com; azaky@qalaaholdings.com; wyckoffcomments; prcaccounting@placidrefining.com; margaret.haydel@placidrefining.com; prccredit@placidrefining.com; dennis.cernosek@placidrefining.com
Subject: STEEL PIPE(SMLS AND WELDED STEEL PIPE)

Dear Manager,

Good day. Greatings from "HUNAN GREAT STEEL PIPE CO.,LTD"

Glad to know that your esteemed comopany on the business of **STEEL PIPE(SMLS AND WELDED STEEL PIPE**). We "Hunan"
specialized in Manufacturing SMLS and WELD steel pipes , Pipe fittings with more than 20 years' production experiences .

Who cooperated with us?

SHELL,PEMEX(Mexico),IBERDROLA(ConstractorSpain),*PDVSA(Venezuela),*PETROBRAS(Brazil),*EIED,NIOC (Iran)and SAUDI ARABIA GAS PIPELINE,*NPDC(Nigeria),NOAC(Nigeria),*and so on.*

What's OD, WT and standard pipes we can offer?

SMLS OD: 6-914MM WALL THICKNESS : MAX 53.98 MM STANDARD: API /ASTM/EN/DIN
ERW OD: 6-610MM WALL THICKNESS : MAX 26.5 MM STANDARD: API /ASTM/EN/DIN
LSAW OD: 273-1620MM WALL THICKNESS : MAX 65 MM STANDARD: API /ASTM/EN/DIN
SSAW OD: 219-3120MM WALL THICKNESS : 3MM-25MM STANDARD: API /ASTM/EN/DIN

What's machineries does our factory equiped with?

Slight-
stretch reducing mill, rotating heat furnace, hot rolling mill, straiterner, ultrasonic and eddy current detection facility, on-line super spiral accumufator, on-line advanced straight edge case forming process, and on-line SXFJ610 Digital Rotatory cutting machine and other US made machineries.

What's kind of service we can provide with you, and why cooperate with us?

1. Full projects reference all of the world and vendor references from the most main oil and Gas in stitute, companies, investors
2. The inspection program is full supported to the docs requirements
3. The list of producing equipment and inspection equipment will be provided

4. The relative shipping docs, third party inspection report, Mill test certification, custom appreciate letters
5. The mill certification such as API monogram , ISO ect....
6. The financial yearly reports in latest 3 years
7. ITP, MPS & ISO manual
8. Full system of after sales records(tracking purpose)
9. Prices competitively level
10. Full presentation experiences and guidance
11. Engineering design & construction capacities
12. Financial supports, various of payment term could be acceptable such as L/C, T/T, OA, DP
13. Logistical and shipping chains, we have signed the yearly agreement with the main NVOCC in China can make helps the saves from shipping
14. Free custom inspection corporation & checked corporation in CCPIT
15. Full bank supported company with a perfect line of Credit "AAAAA"

Please feel free to drop me an email should our company be of your interested.

Hunan Steel Group is always your best choice from China market.

--

Best Regards
Liz Zhang
Industrial Pipe Division
Hunan Great Steel Pipe Co.,Ltd
Skype: geblizzhang
☎Tel:(0086)731-88706020 /(0086)13986059564
☎Fax:(0086)731-88678505
✉💻 **www.steel-pipelines.com**
Hunan Steel Industrial Zone, Tianxin Special District,Changsha City,China

Bottcher, Helen

From: (b) (6)
Sent: Sunday, May 29, 2016 12:25 PM
To: wyckoffcomments
Cc: rtownsend@bainbridgewa.gov; sblossom@bainbridgewa.gov; rpeltier@bainbridgewa.gov; rgelder@co.kitsap.wa.us
Subject: water use concern at Wyckoff Superfund Site

Helen Bottcher
Project Manager
US EPA Region 10

Dear Ms. Bottcher,

I am a neighbor of the Bainbridge Island Wyckoff superfund site. I have lived up the street at (b) (6) or 39 years. On our end of (b) (6), the end closest to Eagle Harbor, we are all on individual wells as there is no water system here yet.

My understanding is that the previous Wyckoff superfund clean-up work used water from a well on the site. At about the same time, the Rockaway Beach neighborhood drilled a well at the foot of Taylor Ave. I'm unclear about whether or not that well is still in use, but I always thought it was ironic that it was (noisily) drilled over many months in our neighborhood, in full view at the foot of our street (blocking our view of the harbor), for water that we couldn't use.

During the time of these two projects, my 80-foot well water supply went from a high of 12 gallons a minute to 2-3 gallons/minute. It has remained at a paltry 2-3 gallons/minute.

Some would say that there is no relation between the water that Wyckoff was drawing, and our well water at 80 feet deep. But no one really understands where our water comes from on the Island, and we in Eagledale (the general area between Port Blakely and Eagle Harbor) have been notorious for low water availability for many decades.

So it concerns me that Wyckoff will begin pumping water for UP TO TEN YEARS at a steady and high rate. Since we don't have a clear understanding of how our underground water moves on Bainbridge, I am worried that our water supply will be further impacted.

Please consider the neighboring residents using well water when you plan to pump well water at high pressures for years to come to clean up the mess.

Thank you,

(b) (6)
Bainbridge Island

Bottcher, Helen

From: (b) (6)
Sent: Sunday, May 29, 2016 12:27 PM
To: wyckoffcomments
Subject: Wyckoff Remedy

I have lived on Bainbridge Island for 22 years and have been following the progress of the cleanup attempts. I cast my vote for the thermal destruction option instead of the Band-Aid approach of the cement solidification. I support the thermal destruction method for the safety of the future of our beautiful Island and so future generations do not need to be dealing with this mess.
Thank you ,
(b) (6)

Bottcher, Helen

From: (b) (6)
Sent: Monday, May 30, 2016 11:53 PM
To: wyckoffcomments
Subject: public comments--please extend again.

Hi, Please include easy access for disabled people to a really nice park at the Superfund Site, so we can walk and wheel on an easy and beautiful site that is easy to get to (with parking for us) and for bikers and walkers, too. Clean bathrooms, nice tables, and benches that would work for disabled people, too. The island demographic is aging. We'd like to still have access even though my husband and I have a hard time getting around sometimes. He is able to ride a bike so bike access and parking is important, too, for us, the children, etc.

I have more to say but it's almost midnight and we were unable to postmark anything today because it was a holiday. Memorial Day.

Thank you for collecting info and working to clean up the site.

(b) (6)

Bottcher, Helen

From: Bottcher, Helen
Sent: Friday, June 03, 2016 10:46 AM
To: wyckoffcomments
Subject: FW: cost table for Wyckoff alternatives

These comments came directly to my personal mail box. I am forwarding them to ensure they are included with the other comments received in the "official" wyckoffcomments mail box.

Helen Bottcher, RPM

-----Original Message-----
From: Eric Moe [mailto:emoe@umci.com]
Sent: Thursday, June 02, 2016 6:02 PM
To: Bottcher, Helen <Bottcher.Helen@epa.gov>
Cc: dschulze@bainbridgewa.gov; Val Tollefson <vtollefson@bainbridgewa.gov>
Subject: Re: cost table for Wyckoff alternatives

Hi Helen,

There are some items that jump out to me and generate questions.

1). I see about 60,000 tons of Portland cement in alt 4 and 30,000 in alt 7. With 40 ton trucks this equates to 1500 and 750 truck trips respectively. I also see O&M costs associated with the road at the site, perhaps a function of heavy truck traffic. To me this is a no-brainier for a barge delivery of materials. Especially with Ash Grove Cement located on the Duwamish for easy access. May be more cost effective too.

2). Why is the well and building decommissioned in alt 7 but not 4?

3) With all the heavy traffic including materials, people, contractors, etc there should be funds allocated to the City to improve the whole road along Eagle Harbor drive to mitigate the impact. Wide shoulder, bike lanes, visibility. Plus O&M funds.

4). Present value of cash flows are higher for Alt 7 than 4 at both 1.9 and 7% cost of capital. If we applied probability of 50% to needing phase 2 of alt 7 then it is a wash. Given this Alt 4 seems like a way better alternative with a cleaner site, less risk the project will carry on way into the future, and no wall that will fail again in the future at cost to the city on the waterline.

I believe I'm convinced now that the capital and operating costs associated with the thermal alternatives 5 and 6 drive us to 4 and 7.

My conversations in the community and others on the advisory group including Charles, Barb, Frank, and Janet plus additional analysis leads me to prefer alternative 4.

Please let me know if this is official input or if I need to send to another email as well.

Best regards,

Eric Moe, MSE MBA
Senior Developer - District Energy, Waste Heat Recovery, Cogeneration UMC Energy & Environment
Email: emoe@umci.com
Cell: (b) (6)
www.umci.com

On Apr 14, 2016, at 2:55 PM, Bottcher, Helen <Bottcher.Helen@epa.gov> wrote:

Hi, Eric. Here is the cost table. It links to databases at CH2M HILL, which you obviously don't have (nor do I). But it still runs OK if you just click "no" when it asks if you want to allow links.

Please don't distribute this. There will be a PDF version in the FFS, but we don't typically distribute the "live" version of our cost tables.

I'll be interested to hear if you find any potential areas for energy and/or cost savings!

Regards,

Helen

<Wyckoff Site FS FINAL 7% v10.xlsx>

Bottcher, Helen

From: (b) (6)
Sent: Friday, June 03, 2016 11:03 PM
To: wyckoffcomments
Subject: Clean it up!

Dear EPA:

Thank you for requesting comments on the proposed clean-up plan for the Wyckoff property on Bainbridge Island. In short, you should clean this up as much as possible and do it without further delay. I have lived on Eagle Harbor since 2004, and this mess is still there, apparently without much happening in the way of cleaning it up. I know that the western part of the beach has been capped and is theoretically safe for human recreational use. But this lovely location should be a part of the Bainbridge Island's park system, not blocked off by cyclone fences and high metal walls.

Alternative 4 seems to me to be the best approach for returning the site to public use and enjoyment. I don't know if you are keeping that metal sea wall, but presumably it will not last forever, so when it is replaced with something more durable for the long run, probably concrete, the design should take into consideration measures that can make it more integrated with the surrounding habitat -- not just a stark wall. The Seattle seawall that is currently under construction may provide some ideas for making this more than just a barrier.

The access to this site is via a rather narrow roadway which is already heavily used. Measures should be included in the project to improve the roadway for pedestrian and bicycle use if the roadway is going to be used by cleanup traffic associated with the site. And since the state just spent a great deal of money attempting to re-establish an eelgrass bed not far offshore from the site, please pay particular attention to avoiding any activities that will jeopardize that eelgrass or any other in the area.

(b) (6)

Bainbridge Island, WA 98110

Bottcher, Helen

From: Griffith, Greg (DAHP) <Greg.Griffith@DAHP.WA.GOV>
Sent: Monday, June 06, 2016 1:14 PM
To: wyckoffcomments
Cc: Griffith, Greg (DAHP)
Subject: Wyckoff/Eagle Harbor Superfund Comments on Proposed Additional Cleanup Actions (DAHP log 050295-21-EPA)
Attachments: removed.txt

On behalf of the Washington State Historic Preservation Officer (SHPO) and the State Department of Archaeology and Historic Preservation (DAHP) I am providing comments on the proposed additional cleanup efforts at the Wyckoff Site.

As part of the initial phase of the cleanup, we are aware that the historic Wyckoff office and plant buildings were demolished. We do not know if the employee housing constructed as part of the company town of Creosote was demolished or are still extant. If any remain, we recommend that surviving structures be documented using DAHP's WISAARD electronic database.

Thank you and please feel free to contact me should you have any questions.

Greg Griffith
Deputy State Historic Preservation Officer
Washington State/Department of Archaeology & Historic Preservation
360-586-3073 (desk)
(b) (6) (mobile)
POB 48343/Olympia 98504-8343
My regular office hours are Monday through Friday, 8:00 am to 5:00 pm
Get involved! Check out Washington's State Historic Preservation Plan 2014-19: Getting the Future Right at www.dahp.wa.gov

Please note that in order to streamline our responses, DAHP requires that all documents related to project reviews be submitted electronically. Correspondence, reports, notices, photos, etc. must now be submitted in PDF or JPG format. For more information about how to submit documents to DAHP please visit: http://www.dahp.wa.gov/programs/shpo-compliance.

Comment 15

Bottcher, Helen

From: (b) (6)
Sent: Thursday, June 09, 2016 3:21 PM
To: wyckoffcomments; Bottcher, Helen
Cc: Sherbina, Debra
Subject: EPA Proposed Plan for Wyckoff Eagle Harbor Site

To Whom It May Concern:

I have read the proposed plan for the Wyckoff Eagle Harbor Site and Plan 7 seems to be a reasonable compromise to finally achieve some cleanup. I have two concerns about the plan, one related to logistics and one related to failure of in-situ soil stabilization to retain contaminants over time.

Regardless of the cleanup plan selected, there will be a mammoth scale transport of machinery and equipment to the site. The road infrastructure on Bainbridge Island is limited, in particular Eagle Harbor Drive, and the costs to upgrade the roads before or restore them after the project is complete need to be added into the estimates. Unless something is in the plan to address the off-site infrastructure, I believe Bainbridge Islanders will become unified against any solution. There is not much to like about any plan that results in the destruction of some of the most important roads on the south end of Bainbridge.

Moving equipment and supplies to the site by water, using barges or landing craft, is an option, but it requires a pier or a hard surfaced beach ramp. A pier or ramp would need to be located carefully to provide access to deep water without sitting on top of soil requiring decontamination. All plans would be improved if acceptable location(s) of piers were identified that would be compatible with the cleanup effort associated with the particular plan. Just showing acceptable pier and ramp locations would be an indication to potential cleanup contractors that water transportation is an option. Finally, a pier remaining on the site after the cleanup could be a useful public asset.

Many of the plans use in-situ soil stabilization (ISS) rather than contaminate removal to achieve the cleanup goals. The track record of ISS seems good, but ISS is not really old technology. If the contaminants that are supposed to be immobile do not remain so after 30 or 50 years, are there options to remove them from the ISS monolith? If there are none, then even though it costs more, removing the contaminants rather than immobilizing the contaminants is preferred.

Thank you for your consideration of my comments.

(b) (6)
Bainbridge Island, WA 98110

(b) (6) **comments to the Bainbridge Island City Council on how the Wyckoff Super Fund Site should be treated.**

I do not like the idea of cementing in place.
I do like the idea of cooking the creosote in a kiln of some kind.
NASA helped design a process for continuously baking plastics in order to convert into light oil.
The creosote used at Wyckoff was produced from oil-tar.
I would like the EPA to do a review of the **Vadxx Energy LLC** process of converting plastic to light oil to see if it would work for creosote.

By using the gas generated during the conversion process to power the kiln the need to haul in propane to cook the creosote should be eliminated.
Any light oil produced could be sold to lower the total cost of cleaning up the Wyckoff Superfund site.

Thanks.

(b) (6)

---

https://en.wikipedia.org/wiki/Creosote
Oil-tar creosote
Oil-tar creosote is derived from the tar that forms when using **petroleum** or **shale oil** in the manufacturing of gas.
The distillation of the tar from the oil occurs at very high temperatures; around 980 °C.
The tar forms at the same time as the gas, and once processed for creosotes contains a high percentage of cyclic hydrocarbons, a very low amount of tar acids and tar bases, and no true anthracenes have been identified.[81]

Historically, this has mainly been produced in the United States in the Pacific coast,
where petroleum has been more abundant than coal.

Limited quantities have been used industrially, either alone, mixed with coal-tar creosote, or fortified with pentachlorophenol.[82]

---

http://spinoff.nasa.gov/Spinoff2016/ee_8.html
Recycling Technology Converts Plastic Waste to Energy

Energy and Environment
NASA Technology
Glenn Research Center has always been in the business of perfecting engines. During World War II, the center, then called the Aircraft Engine Research Laboratory, developed a cooling system for the B-29 Super Fortress—a four-engine, propeller-driven heavy bomber that saw action in East Asia—and also investigated carburetor icing issues in preparation for aircraft flying over the Himalayas into China. In 1945, well before the dawn of the Space Age, trailblazing rocket scientists there began investigating the use of liquid hydrogen as a fuel source, culminating in the development of the Centaur rocket, which would become the Nation's first upper-stage launch vehicle. Since the mid-1960s, Centaur has propelled into space numerous weather probes, communications satellites, and planetary explorers, such as Surveyor, Pioneer, Viking, and Voyager.

A landfill located in Buckhorn Mesa, Arizona. According to the **Environmental Protection Agency**, only 9 percent of plastic waste generated in 2012 was recovered for recycling. According to Jim Garrett, president of **Vadxx Energy LLC**, a major reason for the low number is that many plastics either contain additives and fillers that make them incompatible with current recycling technologies or are contaminated with paper or ink. The company's recycling technology overcomes those limitations as it converts many types of plastic into light crude oil.

While Glenn has continued to flex its rocket-science muscles by improving ion propulsion technology for deep space missions and helping to mature additive manufacturing for rocket engines, the center has also shown its versatility by helping one Cleveland company improve, of all things, an innovative plastics recycling technology.

Technology Transfer

As good as it feels to throw plastic items into the recycling bin, the fact is most of that plastic goes unrecycled, according to Jim Garrett, a veteran of the oil and gas industry. **"Of all the stuff my wife makes me sort on a weekly basis, most of it ends up in a landfill,"** he says. **"It's a dirty little secret in America that 90 percent of our plastic ends up there, if not in our oceans."**

The reason for the low rate of recycling is that many plastics contain additives and fillers that make them incompatible with current recycling technologies, while others are contaminated with paper or ink. "Recycling companies take in the clear water bottles, but most of the other stuff is not recycled," Garrett says. But as the old adage goes, one man's trash is another man's treasure. In 2009 Garrett met **petroleum geologist** and **geochemist** Bill Ullom, who had in mind a technology that could make use of all this unwanted plastic in order to strike oil, or at least manufacture it.
In 2005 Ullom happened on an expired patent for a **thermal depolymerization process** that could **convert plastic back into its original form: light crude oil.** The technology works by sending plastic feedstocks, as well as tires and car interiors, through a shredder, where rotating cutters shred the material before **sending it through an extruder/kiln combination,** where the feedstock is incrementally heated, producing vapor. At the exit of the process path, the vapor is released and **condensed into liquid form** and **distilled** into derivatives of **light crude oil**, namely fuel gas and diesel additive. The last and **only solid byproduct** of the process is **inert char**, which can serve as a strengthening agent in rubber products, among other uses.

Ullom began making improvements to the process that allowed the technology both to run nonstop and to accept contamination from materials such as wood and cardboard. After meeting Garrett, who had the business acumen to get the idea off the ground with investors, he founded Cleveland-based Vadxx Energy LLC and became its chief technology officer, with Garrett filling the role of CEO.

Things moved quickly from there, as the fledgling company initiated public-private partnerships with city and state agencies to receive technical guidance and acquire low-interest loans. Fortune 500 company Rockwell Automation also lent both its technical and plant construction expertise to Vadxx, and the nonprofit Manufacturing Advocacy and Growth Network, or MAGNET, also provided logistical and technical support.

Even so, by 2012 the company still needed help optimizing the kiln's design, which, according to Stan Prybyla, Vadxx's vice president of technology, would be a complex task. "**A proper solution to the problem would have to involve the kiln's geometry, tilt angle, and rotation speed, along with the polymer's thermodynamic and physical properties, during standard processing timescales,"** he says. "**The problem was quite challenging, to say the least."** Yet that's the type of work that falls right in Glenn's wheelhouse.

While one wouldn't necessarily think NASA has much in common with a trash-recycling technology, Paul Bartolotta, a senior technologist at Glenn, says the Agency's work on rocket propulsion makes it especially adept at analyzing such a process. "**We have scientists who for decades have been studying the kinematics of oil decomposition for turbine engines and kerosene rocket engines,"** he says. "**It's still looking at oil—it's just that, in this case, we're extracting it out of waste plastics."**

Glenn's collaboration with Vadxx was made possible through Cleveland and the greater Cuyahoga County's Adopt a City Program, itself a product of the Obama Administration's Strong Cities, Strong Communities Initiative, whereby Federal agencies are asked to team up with local governments to provide technical assistance and other expertise to area businesses. Bartolotta, who wears many hats at Glenn, managed the program on NASA's end.
Vadxx President Jim Garrett and President Barack Obama

Vadxx president Jim Garrett speaks with President Barack Obama about the company's plastics recycling technology at the Manufacturing Advocacy and Growth Network, or MAGNET, Innovation Center in Cleveland. The president visited the town on March 18, 2015, to learn how businesses were benefiting from working with MAGNET, which helped Vadxx connect with NASA Glenn Research Center through the Adopt a City Program, itself a byproduct of the Obama administration's Strong Cities, Strong Communities Initiative.

In May 2012, Vadxx was one of eight companies that qualified for the program (another being Pile Dynamics Inc., featured on page 80), which came with 40 hours of pro bono consultation. As a result, **within the span of a few weeks, a team of four scientists from Glenn's chemistry kinematics group "created a kinematic model where Vadxx could put in the diameter of the kiln, the feed rates, and the viscosity of the polymers, and it'll optimize the process,"** Bartolotta says. "They'd be able to maximize the output of the oil byproduct."

The model proved to be a success, says Prybyla. "We were able to incorporate what we learned into the making of our first full-scale commercial kiln."

Benefits
With a cash infusion from Liberation Capital, **Vadxx is building that kiln** in nearby **Akron**, **with Rockwell Automation leading construction and engineering efforts.** When fully operational, **it will be able to process some 20,000 tons of waste per year to produce 100,000 barrels of petroleum product** that will be sold to distributors and marketers. While Vadxx will operate that facility, its expansion plans center around licensing the technology to other entities. The company estimates there's enough feedstock in the United States to build 1,500 Vadxx units, which would decrease the Nation's oil imports by 7 percent.

And all those units would be environmentally friendly, according to Garrett. **No hazardous byproducts** are created, and, unlike most companies that flare off excess fuel gas, which contributes to global warming, Vadxx **recycles that gas to provide 80 percent of a unit's heating needs.** "From both an economic and environmental standpoint, it's a winner," he says. "The **EPA** [Environmental Protection Agency] **classifies our unit as only a minor emitter**, equivalent to a hospital boiler. And **the key** there is we're **not burning feedstock but melting it** in a vessel. It's not like we're building a new refinery where it takes 10 years to get the approval."

The future looks auspicious for the company, as the technology has generated enormous interest from waste disposal companies and large manufacturing facilities, which stand to gain by paying less money to truck material to a Vadxx unit than to the landfill. What's more, **each unit is projected to make $8 to $12 million per year in revenue** for its operator and **provide 18 full-time jobs.**

Besides the technical leg-up NASA gave the company, Garrett says there was another, more indirect benefit of having partnered with the Agency: credibility. "We'd kind of brag to people that we worked with NASA, and they say, 'Really? I may be interested in investing.' The NASA name has that kind of impact."

Bottcher, Helen

From: (b) (6)
Sent: Sunday, June 12, 2016 5:05 PM
To: wyckoffcomments
Subject: Comments regarding Proposed Plan

Dear Helen Bottcher,

Thank you for the opportunity to comment on EPA's Proposed Plan for the Amendment of the ROD on the Eagle Harbor/Wyckoff site. As residents on the island, raising two small children, cleanup of the site is of paramount importance. We applaud EPA in its effort to address the site and we look forward to a cleanup that is accelerated and more effective in comparison to the first three decades of the site's listing on the NPL.

We have read the Proposed Plan and overall are pleased to see EPA's choice for Operable Units (OU) 1,2, and 4. However, we have some remaining questions and concerns that we would like to see addressed before EPA finalizes its decision for the Cleanup Plan. For ease, we have organized our concerns by OU.

OU 1 – East Harbor

Our main concern with the excavation and capping alternative relates to how the cap will be maintained and monitored. From our experience on the island, we recall last winter heavy rains brought significant flooding and erosion to the beaches around the island. Many beaches had logs piled up that had scoured deep channels in the shoreline. We can only imagine a winter like last would significantly disturb a sand cap. Which agency is responsible for monitoring the health of the cap once it is placed? How often will they be monitoring and what actions will be taken if the cap is found to be deteriorated in places? This is especially important if we consider that the beach will become an extension of Pritchard Park, a popular spot for kids and families on the island.

OU 2 & 4– Upland & Groundwater

We are interested to hear what discussion and planning has taken place regarding the preferred cleanup actions, including the bulkhead perimeter wall and the use of injecting concrete into the soil to immobilize contamination, in regards to a seismic event. Because a fault line runs underneath the site, it would be cavalier not to evaluate the consequence of an earthquake. If the bulkhead wall fails, how much contamination would be released into Eagle Harbor? Would the repair of the wall fall under an emergency action taken by the EPA?

Furthermore, given our placement over a fault line, is there a more aggressive cleanup we can perform on the highly contaminated aquifer so that if the barrier fails, which separates it from the lower aquifer, that aquifer is not contaminated?

We are especially concerned about the health of groundwater on the island as an island with a sole-source aquifer designation. Furthermore, Bainbridge Island is undergoing significant densification and thus increasing its water usage. Just last year, the new pool in Pleasant Beach exhausted the City's water resources in the area and had to have a new pipe fitted. Many farms surround the section of the island where the Wyckoff site is. While the island's growing water usage might seem tangential to the focused cleanup, it is relevant to consider that groundwater contamination might have the gravest impact if not aggressively targeted. Given that previous pumps were clogged because the copious amounts of NAPL released through extraction, we

urge EPA to not adopt a wait and see performance monitoring approach but to invest in utilizing the strategies suggested in Phase II of their preferred alternative.

We are interested to hear if EPA conducted any modeling of their ISS alternative and its effect on the upper aquifer. Would heavy construction and injection of cement impact the barrier that separates the lower aquifer from the upper? Lastly, can EPA please inform us whether floating LNAPL in the aquifer might re-contaminate the sediment that is being cleaned through ISS technologies?

In summation, we would like to applaud the EPA on its efforts to remediate the Eagle Harbor/Wyckoff site. While we appreciate EPA's preferred alternative, we strongly urge Phase II actions that address groundwater be subsumed under phase I actions. Furthermore, we would like to understand the extent to which EPA has planned for the consequences to the remaining cleanup fixtures on the site in the event of an earthquake. If not, we would encourage the EPA to do so.

Thank you for the opportunity to comment. We look forward to a cleaner island, thanks to your efforts!

Sincerely,

(b) (6)

Bainbridge Island, WA 98110

June 10, 2016

Helen Bottcher, Project Manager (ECL-122)
U.S. EPA Region 10
1200 6th Ave., Suite 900
Seattle, WA 98101

Re: Citizen Comments on the Wyckoff/Eagle Harbor Superfund Site Proposed Plan

Dear Helen:

This letter provides public comments on the Wyckoff/Eagle Harbor Superfund Site Proposed Plan. As Bainbridge Islanders and Technical Assistance Grant Committee participants, we've witnessed and reviewed Wyckoff/Eagle Harbor's investigation and cleanup for almost 30 years. As Environmental Geochemist and technical readers, we recognize the site's complexities and respect EPA's willingness to reassess the preferred remedy in light of the last 15 years' technological developments.

Alternative 4 Greater Ranking than Alternative 7 (or 7A)

- The Soil and Groundwater OU2/OU4 Focused Feasibility Study (FFS) ranks Alternatives 4 and 7 identically based on the National Contingency Plan's required Nine Criteria (Table ES-1). However, Table ES-2 identifies Alternative 4's technology duration as 10 years compared with Alternative 7's almost 24 to 34 years. This comparison suggests that the two alternatives should be ranked differently for Short-term Effectiveness, with Alternative 4 ranking higher. The shorter completion would also rank higher for Community Acceptance.
- Table ES-2 shows the cap in place under Alternative 4 by year 4, allowing the use of the park in the shorter term (and ranking higher for Community Acceptance).
- I understand that EPA had some concern about topographic changes in the site's surface from Alternative 4, however, the community and the Bainbridge Island Parks Department have consensus that topography is not a problem for the site's use as a park, as I understand plans for future use.
- Sheet pile wall: Alternative 4 includes solidification that creates a new bulkhead for the site while immobilizing contaminants; whereas Alternative 7 includes the installation of a new sheet pile wall in addition to a reinforced concrete bulkhead. The addition of driving the new sheet pile wall will have noise impacts on the community, would inhibit the final park configuration, and appears to be a redundant cost when compared with Alternative 4.
- Noise impacts for Alternative 7 are 7 years (vs. 3 years for Alternative 4) and involve prolonged traffic for the community. Further noise impacts include installing the new sheet pile wall and thermal treatment in addition to *insitu* stabilitization. Therefore, noise impacts for Alternative 7 appear longer and louder in impacts.
- As stated, traffic and roads maintenance are of greater impact and issue for Alternative 7 than for Alternative 4 due to the length of time and added activities. Where possible, barges should be used to transport materials and equipment via water.

Habitat Value in New Concrete Bulkhead: Seattle Seawall Project

Seattle's replacement seawall has been designed to maximize its habitat value. We see an opportunity to benefit from Seattle's studies and designs with the new cement wall to maximize its habitat

potential. While Eagle Harbor is a working harbor, the head of Eagle Harbor is considered a valuable nursery for fish and wildlife. Bainbridge Island is considered essential to fish and marine health of middle Puget Sound. The Bainbridge Island Community thanks EPA for its efforts to restore this valuable ecosystem and encourages the use of fisheries and wildlife experts to complete not only the cleanup but to restore the Park to its fullest value as ecosystem. EPA can benefit from the designs used by the Seattle Seawall Project in the completion of the cement wall for Alternative 4. The shorter timeframe for completion of Alternative 4 will then have greater value as it not only completes the cleanup, provides public access to a cherished park, but also increases the habitat value at the mouth of Eagle Harbor, benefiting Puget Sound.

Beach Cleanups to ISS Onsite
For the Nearshore/Beach Operable Unit cleanups, is it EPA's intent when excavating contaminated beach to consolidate it onsite and use stabilization to treat it with OU2/OU4? If this is not the intent, we recommend the consolidation of contaminated soil and sediment to minimize the need for offsite transport and disposal.

Road Maintenance Upgrade for Bicycle and Pedestrian Safety
With any alternative, Eagle Harbor Drive and possibly other roads will need upgrades to allow the travel of large trucks and due to the wear of extra traffic. Like the Concrete Habitat Wall, the road upgrades provide a valuable opportunity to include bicycle lanes that may be used by pedestrians—so that the many commuters and community members may safely bike and walk during the active cleanup.

In summary, we find that Alternative 4 would rank higher than Alternative 7 using the National Contingency Plan's required Nine Criteria because it achieves protectiveness in a shorter timeframe with less impacts on the community by traffic, noise, and road maintenance, returning the site to the community for use as a park sooner. With Alternative 4, the beach cleanups can be consolidated and treated as part of the upland and then capped. We strongly recommend seizing two valuable opportunities: (1) the use of designs from the Seattle Seawall Project to maximize the habitat value of the new concrete bulkhead and (2) including bicycle lanes in road upgrades for cyclist and pedestrian safety, to mitigate the considerable active cleanup traffic. Where possible, equipment and materials should be transported by barge rather than by truck via the narrow island roadways.

Thank you for the opportunity to comment and for the progress made under your able project management.

Sincerely,

Janet Knox and Tom Fehsenfeld
(b) (6)
Bainbridge Island, WA 98110
janet@pgwg.com

Bottcher, Helen

From: (b) (6)
Sent: Wednesday, June 15, 2016 10:44 AM
To: wyckoffcomments
Subject: RE: Comments on Wykoff-Eagle Harbor remediation

Dear members of the EPA,

Thank you for extending the comment period to June 30th, 2016.

Not being an expert on the superfund site at Eagle Harbor-Wykoff site, the information is presented well but is extremely dense.

I have attempted to understand the alternatives to remediation for the site. Comparing Alternative 4 to Alternative 7 it seems the differences appear to be based on more expensive (#4) to less expensive (#7) for passive ground water discharge/treatment; as mentioned in Section 9.3.6 it was stated that Alternative 4 is "slightly more difficult to implement"; and that Alternative 7 does not have listed debris removal for the Upland section as seen in chart listed in Section 8 of the EPA document.

My preference would be to choose Alternative 4 over 7 based on the need to have enough funds available for protecting passive water discharge/treatment and to have funding available for debris removal. In addition, according to J. N. Knox and D. T. Fehsenfeld, choosing Alternative 4 achieves protection in a shorter time frame with less impacts on the local community, as well as the beach cleanup can be consolidated and treated as part of the Upland project and capped. Knox and Fehsenfeld also suggest that combining designs from the Seattle Seawall Project will maximize the habitat value of the concrete bulkhead as well as would include bicycle lanes during road upgrades to add safety for the public.

Thank you for considering my thoughts and opinions.

(b) (6)

Bainbridge Island, WA

Comment 20

CITY OF BAINBRIDGE ISLAND

June 15, 2016

Helen Bottcher, Project Manager (ECL-122)
U.S. EPA Region 10
1200 6th Ave., Suite 900
Seattle, WA 98101

Re: Comments on the Wyckoff/Eagle Harbor Superfund Site Proposed Plan

Dear Ms. Bottcher:

The City of Bainbridge Island is grateful to the EPA for its continued efforts to remediate the Wyckoff Superfund Site, and welcomes the opportunity to comment on its new proposed clean-up actions for that site.

A number of citizens have shared with us their views of the EPA's Preferred Alternative 7, and of other alternatives, both those considered by the EPA and otherwise. For reasons contained in the public comment to you by environmental geochemist Janet Knox and renewable energy engineer Eric Moe, we are persuaded that Upland Alternative 4 is the approach that would best balance the goal of cleaning this site with other important interest of Bainbridge Islanders, including returning the site to public use at an earlier date, and minimizing the impact to the community by shortening the duration of the clean-up effort. We urge you to choose Upland Alternative 4 as EPA's preferred alternative.

As you move forward with your efforts at this site, whatever alternative is ultimately chosen, we trust EPA will make a major effort to mitigate the effects of its work on the local community. Such mitigation should reasonably include financial support for improvements for bicycle and pedestrian safety on Eagle Harbor Drive in consideration of the increased truck traffic attendant to the work. Relocation of the east driveway so that the eastern slope of Pritchard Park is better protected, and provision of ADA access just south of the containment area would also be reasonable mitigation efforts.

Thank you for your efforts, and for the opportunity to comment.

Sincerely,

Val Tollefson, Mayor

280 Madison Avenue North
Bainbridge Island, Washington 98110-1812
www.bainbridgewa.gov
206.842.7633

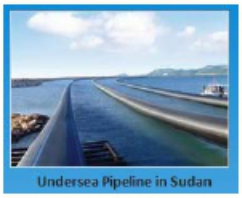
Comment 21

Bottcher, Helen

From: 张玲 <liz@hunantube.com>
Sent: Thursday, June 23, 2016 5:57 PM
To: wyckoffcomments
Subject: [SPAM] STEEL PIPE(PROJECT LIST FOR YOUR REF)

Dear manager,

Good day! It's Liz again from **Hunan Great Steel Co., Ltd (HGSP)**, one of the biggest steel pipes/tubes manufacturer in China.
With 22 years' experience, we have well accomplished over 100 projects worldwide annually with good reputation:

Project Area	Europe, Asia Pacific, Africa, Mid-east, America, etc				
Partial Clients	Shell Oil, CNPC, SINOPEC, SASOL, BROOKFIELD MUTIPLEX, SWCC, VISION CONSTRUCTION GROUP, etc				
Project Field	Oil & Gas	Construction	Industrial Usage	Environmental Equipment	Marine & Offshore
Live Pictures	 Pipeline transport in Iran	 Oil Pipeline Project in UAE	 Geothermal Project in Swizerland	 Coastal Chemical in U.K	 Offshore Pipeline Project in Chile
	 Oil Field in Venezuela	 Casing & Tubing in Vietnam	 Undersea Pipeline in Sudan	 Heating Supply System in Algeria	 Liquid Transportation in China

Our Advantages:

Full projects reference all of the world and vendor references from the most main Oil and Gas institute ,companies ,investors
The inspection program is full supported to the docs requirements
The list of producing equipment and inspection equipment will be provided
The relative shipping docs ,third party inspection report ,Mill test certification ,custom appreciate letters
The mill certification such as API Monogram ,ISO etc
The financial yearly reports in latest 3 years
ITP ,MPS & ISO manual
Full system of after sales records (tracking purpose)
Prices competitively level
Full presentation experiences and guidance
Engineering design &Construction capacities....

Hope our steel pipes will take you further.
Appreciate your time and hope to serve you with business. Thanks.

Best Regards
Liz Zhang
Industrial Pipe Division
Hunan Great Steel Pipe Co.,Ltd
Skype: geblizzhang
☎Tel:(0086)731-88706020 /(0086)13986059564
☎Fax:(0086)731-88678505
✉💻 www.steel-pipelines.com
Hunan Steel Industrial Zone, Tianxin Special District,Changsha City,China

Bottcher, Helen

From: (b) (6)
Sent: Friday, June 24, 2016 10:06 PM
To: wyckoffcomments
Subject: Gander Comments

The following was published as a guest column in the June 24 edition of the Islander weekly newspaper:

The EPA has proposed a clean up remedy ("Alternative 7") at the Bainbridge Island Wyckoff Superfund site that binds the contamination with cement, thereby solidifying the toxic material so it does not leach into Eagle Harbor and the underlying groundwater. EPA acknowledges that this is not a permanent solution, meaning that the cement will eventually degrade and release the cancer-causing material to the environment at some later date. Yes, it is a short-term solution. But why would we spend an estimated $80 million dollars on a remedy that only works for a finite and ill-defined period of time, only to revert back to the current conditions of thousands of tons of leaching contamination?

Alternative 6 is a better solution, which destroys the contamination by heating it to 1100 degree F and burning off the creosote. The successful implementation of thermal destruction is a certainty, unlike the non-permanent cement solidification. Alternative 6 was eliminated primarily due to a $160 million dollar price tag that was assigned using a series of conservative assumptions, including excavation to 20 feet below ground surface. The $160M price tag can be lowered by more than 25% by focusing on the removal of hotspots identified in the Targost studies; eliminating the thermal enhanced extraction aspect of the Alternative 6 option and focusing on the slower but proven aerobic bacterial breakdown of the deeper creosote; and eliminating some of the costly aspects of the $40 million "common elements" that all of EPA's alternatives have advertised as essential remediation construction costs.

Thus, a modification of Alternative 6 will bring the price tag close to Alternative 7, and give Islanders a more permanent solution they deserve. The permanent and immediate destruction of most of the contamination hotspots will also reduce forever the leachate that will eventually resurface after the cement solidification remedy degrades over time.

We should be wary of EPA's claims of the suitability of the cement solidification remedy. In 2001, the EPA stated that the 1,800 foot steel sheet pile wall surrounding the site would last 50 years. As of 2015, less than 15 years later, the wall is badly corroded and leaking. In 2003, EPA spent millions on the failed steam injection pilot test, and have yet again resurrected this questionable technology as a "wet steam injection" aspect of Alternative 7.

These past failures illustrate the difficulty in addressing a challenging site impacted by corrosive seawater and contaminants that are by nature resistant to remediation. EPA's remedy has considerable uncertainty, and their report acknowledges that cement solidification has never been completed on a site of this size, depth, and physical conditions.

Please tell EPA you want a permanent solution by thermal destruction, not cement solidification. Send your comments regarding the Wyckoff/Eagle Harbor Proposed Plan and Feasibility Study to https://cumulis-epa.gov/super-cpad/cursites/csitinfo.cfm?id-1000612.

Melanie Keenan and Malcolm Gander, authors of the 2009 EPA-approved Bainbridge Island Sole Source Aquifer Designation

Bottcher, Helen

From: (b) (6)
Sent: Friday, June 24, 2016 11:17 PM
To: Skadowski, Suzanne
Cc: wyckoffcomments
Subject: (b) (6) Wyckoff Comment #2

Comment #2 to EPA from (b) (6)
Below are two responses from the EPA to questions I previously posed in May 2016 regarding the estimated duration of performance of the cement stabilization/solidification ("ISS") remedy proposed in the April 2016 FFS.
I believe that it is encumbent upon the EPA and their contractor to present an estimated duration, the complexity of such an estimate notwithstanding, particularly in light of the fact that this remedy requires $80M of taxpayer money. The contractor should present performance calculations and the attendant assumptions. The contractor should also draw from other sites where ISS was used in coastal environments, even if the volume and depth of contamination at those sites, if applicable, were not as deep or as large.

From: "Helen Bottcher" <Bottcher.Helen@epa.gov>
To: (b) (6) "ken scheffler" <ken.scheffler@ch2m.com>, "Beth Sheldrake" <sheldrake.beth@epa.gov>
Sent: Wednesday, May 18, 2016 9:03:12 AM
Subject: RE: Ken, Beth and Helen: Did You Receive This Request Sent Yesterday? Please Advise. Thanks. Malcolm

Hello Malcolm.

In response to your first question, we don't have an estimate of the how long the in-situ solidification portion of the remedy will remain intact. Where ISS has been used at other EPA sites, the remedies have remained protective since they were constructed, but that provides only 15 or 20 years of data. I've attached an EPA technology review and a more detailed review conducted at an MPG site in Georgia. At the site in Georgia, the ISS mass continued to gain strength over 10 years, suggesting very good long term performance.

EPA believes that ISS at the Wyckoff site would remain protective for a very long time. Concrete is durable over decades, even when exposed to the elements. In this case, the treated soil monolith will be protected behind the perimeter wall and under the final upland cap. Under these circumstances, **we expect it to last well beyond the 100 year O&M period** considered in our evaluation. When the concrete does start to break down, we don't expect it to just disintegrate. The failure mode would likely be cracking or degradation around the edges of the monolith. Cracking would increase the surface area of the monolith. Along newly exposed faces, contaminants could leach into the groundwater. But we don't expect the monolith to release NAPL, even when it cracks – after ISS, the contamination will no longer be present as a separate phase product.

From: "Hun Seak Park (ECY)" <HPar461@ECY.WA.GOV>
To: (b) (6)

Cc: "Ken Scheffler" <Ken.Scheffler@CH2M.com>, "Helen Bottcher" <Bottcher.Helen@epa.gov>, "Hun Seak Park (ECY)" <HPar461@ECY.WA.GOV>
Sent: Wednesday, May 18, 2016 3:01:14 PM
Subject: RE: Small Request

Hi Malcom,

Good to communicate with you again here over the email.

Annual budget we have allocated for the operation/maintenance (labor + parts repairs/replacement + disposal of waste products collected + routine maintenance + contingency, etc.) of Wyckoff Plant is right about $850k. Actual expenditure is slightly less than that.

I do not think there is any place in FFS to discuss about the life-span of ISS (immobilizing NAPL in a cement/bentonite -type matrix). Cement itself is a very strong chemical binding material through chemical reaction. Like many ancient huge dome structures in Rome, which were made from concrete (cement-mixture) are still standing till now. Portland cement is hydraulic cement. Once it is cured under optimal condition, it becomes sparingly soluble and standing so long even under the salty water condition. I do not think you are really concerned about the breakability of this cement structures (ISS) to be constructed below ground. Rather we all are more concerned about leachability when NAPL becomes stabilized with cement/bentonite. Through the bench-scale testing, EPA will find the most optimum design conditions of ISS technology to meet the Remedial Action Objectives stated in draft PP.

One note about your preference on the use of thermal desorption/extraction technology of top (partial) portion of NAPL residual..... Without knowing the detail of you proposal I do not think it will work due to the huge cross-contamination issue of the cleaned top portion of dirt. I will be very interested to see your alternative.

Thanks for your concerns.

Hun Seak Park, P.E.
Senior Civil and Environmental Engineer
Washington State Department of Ecology
Toxics Cleanup Program
300 Desmond Drive, PO Box 47600
Olympia, WA 98504-7600

360-407-7189 (Direct)
(b) (6) (Cell)
e-mail: hpar461@ecy.wa.gov

-----Original Message-----
From: (b) (6)
Sent: Wednesday, May 18, 2016 1:22 PM

To: Park, Hun Seak (ECY) <HPar461@ECY.WA.GOV>
Subject: Small Request

Hello Mr. Park:
It was nice to meet you at the RITS Conference last week.
Two questions:
1) What is Ecology's annual budget to run the groundwater treatment system at Wyckoff? I don't need the exact amount - an estimate is fine; is it about $1M/year?
2) You mentioned that you thought the selected remedy of insitu solidification/stabilization at Wyckoff would last 100-200 years. Could you please tell me where that is written and send me the documented estimate?
Thank you very much.
Sincerely
Malcolm Gander

Sent from my iPhone

Bottcher, Helen

From: (b) (6)
Sent: Friday, June 24, 2016 11:43 PM
To: Skadowski, Suzanne
Cc: wyckoffcomments
Subject: Gander Wyckoff Comment #3

On page 4-9 of the April 2016 FFS, the following is stated:

"*For Alternatives 4 and 7, the primary implementation challenge would be the scale of ISS treatment, which would be one of the largest ISS treatment projects to date. Vertical auger mixing to depths of 55 feet and ject injection to depths of approximately 70 feet represent the upperlimit for this type of equipment, therefore, treatment rates could be slower than initially estimated.*"

Please provide the backup information that these statement is based on.
-What are the existing projects that are fairly large and serve as benchmarks for the Wyckoff site. The site(s) you are apparently referring to must have had injections of cement to 70 feet below grade and mixing to depths of 55 feet - please clarify if this is the case, or clarify that these mixing and injection depths were actually extrapolations of shallower site conditions.
-Are these benchmark sites at locations with a water table within ten feet of the ground surface?
-If they have a high water table, is that groundwater brackish?
-What are the ages of the benchmark sites and how are they performing?
-What were the stated durations of performance at these benchmark sites? If, as at Wyckoff, the EPA/contractor have chosen to be silent on estimated performance durations before the cement begins to degrade, please state as such.

Comment 25

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47600 • Olympia, Washington 98504-7600
(360) 407-6000 • TDD Only (Hearing Impaired) (360) 407-6006

June 27, 2016

Attn: Helen Bottcher, RPM
U.S. EPA Region 10 (ECL-122)
1200 Sixth Avenue
Seattle, WA 98101

RE: Washington State Department of Ecology's (Ecology) comments on the Proposed Plan for Amending the Records of Decision for the Wyckoff/Eagle Harbor Superfund Site (OU 1, 2 and 4), April 2016, prepared by US EPA R10

Dear Ms. Bottcher:

Thank you for the opportunity to provide a final review of the Proposed Plan for cleaning up contamination remaining at the Wyckoff Eagle Harbor Site. Ecology appreciates our collaborative partnership as you have led the development of the Focused Feasibility Study and Proposed Plan. As previously affirmed, Ecology supports the Proposed Plan an interim action in the upland and in-water portions of the Site.

Following our recent discussion of the Proposed Plan, we have a remaining question for clarification of work proposed in OU1 (East Harbor). Please review this request to further clarify how current RAOs meet the substantive requirements of SMS as it has been proposed as an ARAR.

In Section 7.1.2 of Proposed Plan, EPA proposes Nearshore RAO (Remedial Action Objective) #4 for East Harbor as follows:

> *"Reduce levels of COCs in shellfish tissue to concentrations that protect Tribal shellfish consumers."*

Ecology supports the objectives for East Harbor of reducing contaminant concentrations in shellfish to acceptable levels for tribal consumption. Through Nearshore RAO #4, protection of human health (e.g., tribal consumers of shellfish) from bio-accumulative risks will be achieved by establishing target tissue concentrations for shellfish.

Establishment of a sediment cleanup level is considered a substantive provision and minimum requirement in the SMS framework that should be met as an applicable or relevant and appropriate requirement (ARAR) at all state and federal sites (WAC 173-204-505(5), 173-204-570(3), and 173-204-575(3)). For cleanup purposes, the goal of the SMS is to reduce exposure to sediments contaminated with chemicals from cleanup sites and sources (WAC 173-204-500(1)). Tissue concentrations can be used in a weight-of-evidence approach for determining compliance with sediment cleanup standards, and to verify the action is meeting any established tissue background concentrations (WAC 173-204-560(7)(c)).

Ecology's concern about the issue above is as follows:

> *Is "Reduction of COC levels in shellfish tissue to concentrations that protect tribal shellfish consumers" equivalent to "Reduction of sediment concentration that protect tribal shellfish consumers – background sediment concentration"?*

Please describe the process that demonstrates "equivalency of both approaches" or how the establishment of the shellfish tissue concentration that is protective of tribal shellfish consumption is more stringent than the establishment of a sediment cleanup level that is protective of both the benthic community and human health.

Ecology understands and fully supports the EPA objective to complete the Proposed Plan and prepare the Interim ROD. We look forward to continuing to work with EPA in moving cleanup actions at Wyckoff ahead.

Sincerely,

Hun Seak Park

Hun Seak Park, Site Manager

CC: Barry Rogowski, Department of Ecology, Toxics Cleanup Program
Rich Brooks, The Squamish Tribe, Fisheries Department

Bottcher, Helen

From: (b) (6)
Sent: Tuesday, June 28, 2016 7:51 AM
To: wyckoffcomments
Subject: Fwd: Wyckoff/EagleHarbor Proposed Plan and Feasibility Study

Begin forwarded message:

From: (b) (6)
Subject: Wyckoff/EagleHarbor Proposed Plan and Feasibility Study
Date: June 28, 2016 at 7:08:45 AM PDT
To: https://cumulis-epa.gov/super-cpad/cursites/csitinfo.cfm?id-1000612

This project seems to go on for ever. When we came to the Island 18 years ago the project to clean up the Creosote site was in full swing.
There does not seem to be a definite answer to the cleanup even now. Admittedly the problem is a complex but 18 years and still no final solution.
Cost is always the bottom line. Of the Alternatives for the solution only one will really solve the problem. What it has always been.
Get rid of the contaminants.
Any partial solution will always have problems recurring in the future.
We live here, the EPA will be long gone when the next problem with Creosote arises.
The Alternative 7 "concrete fix " is not permanent. Certainly better than what we have now , but the best and supposedly final solution Alternative 6 ,burning off the creosote is still the only truly complete solution.
Or is it?
After all these attempts to steam off the creosote with failing seals, enclose it with metal walls which degrade,cover it with snad which shifts with the currents what is THE solution?
I suspect there isn't one unless we get rid of all the creosote which is on the point.
Can EPA bear the cost? We certainly must find 10%. But to me the vexing question is will we really be rid of the creosote EVER?
When we agree to your solution the EPA will be long gone when the next creosote contamination area appears and then the State of WA and Bainbridge Island will be left to solve the problem of creosote contamination the harbor and beaches once again.
So my vote is for Alternative 6. Get rid of the stuff, IF you can

Sincerely
(b) (6)
Bainbridge Island WA 98110

Bottcher, Helen

From: (b) (6)
Sent: Wednesday, June 29, 2016 11:52 AM
To: wyckoffcomments
Subject: Permanent Remediation

.....by thermal destruction, not cement solidification please. Let's REALLY clean up this site!

(b) (6)
Bainbridge Island WA 98110

Bottcher, Helen

From: (b) (6)
Sent: Wednesday, June 29, 2016 12:17 PM
To: wyckoffcomments
Subject: Wykoff Super Fund Site 2016 Comment

Re: Bainbridge Island Wyckoff Superfund Site Proposed Remediation

Though the EPA has addressed the Wykoff Superfund Site for many years, only recently have I, and other Bainbridge Islanders, been made aware of the mechanics of Alternative 7 as a future remedy.

I object to Alternative 7 for three reasons:

1) The process of using cement solidification focuses on containment, not removal, and will not eliminate cancer-causing chemicals from the site. 2) The cement solidification would force hazardous waste deeper into the aquifer contaminating our limited ground water supply further. 3) Alt. 7 would lead to an even bigger cost clean up down the road with the additions of thousands of tons of contaminated concrete slurry added to the site.

The estimated cost of Alternative 7 is $80 million. That would be $80 million spent *knowing* that cancer-causing chemicals will not be eliminated.

There is another alternative, Alternative 6, which, in the modification suggested by geologists Gander/Keenan, will remove hot spots through a high-heat burn. Alternative 6 is all-around more effective because it is a more permanent solution.

As a Bainbridge Island resident, I'm very concerned about the harbor's active-pollution impact on our aquaculture and human health. I endorse the modification plan of Alternative 6 and urge the EPA to follow this line of remediation.

Respectfully,

(b) (6)

Bainbridge Island, WA

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

Caring for
your natural resources
... now and forever

June 20, 2016

Helen Bottcher, Project Manager
U.S. EPA Region 10 (ECL-122)
1200 6th Ave.
Seattle, WA 98101

Subject: Proposed Plan for Amending the Records of Decision for the Wyckoff/Eagle Harbor Superfund Site (Operable Units 1, 2, and 4)

Dear Ms. Bottcher,

Please accept these comments from the Washington State Department of Natural Resources (DNR) regarding the Proposed Plan for Amending the Records of Decision for the Wyckoff/Eagle Harbor Superfund Site (Operable Units 1, 2, and 4).

DNR is the manager of 2.6 million acres of state-owned aquatic lands (SOAL). DNR is committed to sustainably managing the state's resources, relying on sound science, and making transparent decisions in the public's interest and with the public's knowledge throughout the environmental review and remediation process.

DNR commends EPA for its willingness to modify remedies to address deficiencies in progress towards remediation goals and to implement these proposed remedies to speed up the recovery process; the extensive investigative work conducted to develop this proposal; and the outreach efforts put forth to ensure a thorough public review process.

It is understood that this is a proposed cleanup to further address soil and groundwater contamination at the former Wyckoff wood treatment facility and that EPA is proposing to use a combination of cleanup technologies to accomplish.

We understand the plan for the upland portion of the site is to mix cement and other reagents into the most heavily contaminated soil more than 50 feet below ground with the intent to prevent the contamination from moving any further. In less contaminated areas, contaminants will be extracted with new groundwater wells, and air and nutrients will be injected with the intent to speed the natural breakdown of contaminants by bacteria, hopefully reducing the need for treatment in the passive groundwater drainage system. Finally, a thick layer of clean soil will be placed over the soil and a new concrete perimeter wall will be built next to the existing metal wall.

There will be an outfall that drains groundwater from this area and on-going monitoring will be conducted to ensure that discharge remains within the permitted levels noting that treatment will be increased as necessary to meet these levels. If discharge requirements cannot be met treatment and/or further remedial action will occur.

In the adjacent beaches, EPA will remove contaminated sediments to a depth of 30 inches and backfill with a clean sand cap designed to prevent contaminants from coming up to the beach surface.

It is understood that this is considered an interim action and that further actions may be proposed based on success of initial action to be determined by on-going monitoring and additional TarGOST studies.

After reviewing the proposal DNR offers the following comments:

1) We understand impacts to eelgrass beds in certain areas may not be able to be avoided during the remediation process. It is DNR's hope that remedial actions taken on beaches are sufficient to remove and/or contain contaminants to level sufficient to eliminate need for re-entry at a later date.

2) DNR is encouraged by language in Section 4.4.3. Mitigation plans for eelgrass impacts need to be addressed upfront to be certain there is no net loss of habitat function from these actions (see WDFW, WAC 173-26-186 – shoreline master program, WAC 365-190-130, 220-110-280 – No Net Loss).

3) Eelgrass mitigation plans should weigh whether natural recruitment will take place, where mitigation stock should be planted, where it should be acquired, whether re-establishment will be an issue and take into account temporary loss when developing mitigation goals and objectives. We need to ensure that, at minimum, previous density and area of coverage are achieved and that sufficient restoration, maintenance and monitoring is implemented to ensure this success.

4) DNR eelgrass experts can assist with plans to salvage eelgrass from removal areas, develop monitoring plans for remaining eelgrass beds, develop mitigation/restoration goals and objectives, as well as monitoring plans to ensure these goals and objectives are met.

5) Proposal states that a new wall will be constructed inside the existing wall yet in previous discussions I have been told this may not be able to be accomplished due to presence of large debris placed inside the wall. We support and prefer the plan as proposed.

    a. If during the design phase it is determined that the new concrete wall has to be built outside the existing wall, the hydrodynamics should be modelled (e.g., wave energy, water reflection, etc.) to assess potential and/or likely impacts to existing eelgrass beds. Any negative impacts to eelgrass beds should be accounted for in an eelgrass mitigation plan developed prior to implementation of remedial action. We ask that EPA consult with our eelgrass experts (as they have done in the past) to develop the eelgrass assessment and mitigation plan.

6) In regards to impacts to SOAL and need for a use-authorization from DNR:
    - The Wyckoff OU-1 Focused Feasibility Study Area includes tidelands only, with the water ward limit crossing back and forth over the 0.0 contour (see Figure 2-2).
    - Based on the NAPL concentrations (Figure 3-6 and Figure 3-7) and proposed remedial action, there does not appear to be any dredging/capping extending below perhaps -1.0 MLLW (at the NW area of the North Shoal).
    - The tidelands are not SOAL. Non-SOAL tidelands extend to extreme low tide (-4.5 MLLW). Therefore, the proposed remedial actions (dredging/capping/sheet pile wall) as proposed in the study area would not require a DNR use authorization, however, it is unclear whether the outfall would extend onto SOAL.

- The proposed remedial action relies heavily on barge use. The presence of barges on SOAL – as they will likely be moored nearby for long periods of time and not be "in navigation" – would require a DNR use authorization in the form of a **right of entry** (a license that conveys no property rights).
- The principal habitat stewardship measure DNR would likely require include locating, mooring, and moving the barges to:
  -avoid/minimize grounding (objective: avoid crushing benthic organisms),
  -avoid/minimize the need to spud down/anchor in eelgrass (objective: avoid damaging native submerged aquatic vegetation), and
  -avoid/minimize the duration of shading from extended barge moorage at any one location over eelgrass (objective: avoid damaging native submerged aquatic vegetation).

- Should an outfall extend onto SOAL now or in the future EPA would need to work with DNR and long-term manager of this site/outfall (most likely City of Bainbridge) to develop an easement for this outfall.
- EPA should apply to the local DNR office (Orca-Straits District; 5310 Eaglemount Rd.; Chimacum, WA 98325) for a use authorization for the barges and, if necessary, easement for the outfall.

7) Regardless of whether outfall extends onto SOAL discharge from this outfall could negatively affect sediment quality of SOAL. DNR asks that we be kept informed of any exceedances detected from monitoring results and ask that increased treatment and/or proposed Phase II remedial action be implemented sooner than later should significant and/or ongoing exceedances occur.

DNR appreciates the opportunity to submit comments on the Proposed Plan. Should you have any questions regarding this letter, please do not hesitate to contact me at 360-902-1064.

Sincerely,

Shayne Cothern
Site Manager, Sediment Quality Unit, Aquatics Division

cc: Kristin Swenddal, Aquatics Division Manager
Jeff Gaeckle, Nearshore Scientist
Dennis Clark, Assistant Division Manager, Orcas District

Comment 30

From: Association of Bainbridge Communities (ABC)
365 Ericksen Avenue, Suite 327
Bainbridge Island, WA 98110

Date: June 29, 2016

Subject:
ABC Comments on Proposed Plan for Amending the Record of Decision for the Wyckoff/Eagle Harbor Superfund Site (Operable Units 1, 2 and 4)

To: Helen Bottcher, Project Manager
(ECL-122) U.S. EPA Region 10
1200 6th Ave., Suite 900 Seattle, WA 98101
wyckoffcomments@epa.gov

References:
1) Proposed Plan for Amending the Record of Decision for the Wyckoff/Eagle Harbor Superfund Site (Operable Units 1, 2 and 4) EPA, April 2016
2) Citizen Comments on Wyckoff/Eagle harbor Superfund Site Proposed Plan submitted by Janet Knox June 10, 2016

Dear Ms. Bottcher:

BACKGROUND
It has been 30 years since ABC collected 2,000 signatures asking that the Wyckoff Creosote Facility be placed on the National Priorities List (NPL). This petition was delivered personally in 1986 to our then - U.S Representative in Washington DC. The following year the site was placed on the NPL. Since that time ABC has been actively representing the community on the cleanup working in coordination with EPA. In the past this included having a consultant financed via the first Region 10 Technical Assistance Grant (TAG) and writing articles in ABC's newsletter *Scotch Broom*. More recently ABC members have been serving on the Wyckofff Community Interest Group. There have been many successes and even a few failures over the intervening three decades. In the beginning the goal was for the site to be "cleaned up." We, along I believe with EPA, used this term as if the contaminants would be removed, but as time went on the reality showed that the contamination of the site was worse than expected. For example the *Bainbridge Review* reported (December 10, 1997) that "Divers recently discovered pools of toxic pollutants between 20 and 40 feet wide floating on the floor of Eagle Harbor near the Superfund site." This discovery was recently described in the EPA video (https://www.youtube.com/watch?v=oz68qSUSsOA). Also 10 years ago EPA estimated 500,000 gallons of creosote remained underground; the updated estimate is now at 650,000 gallons. The wide extent of contamination and a feasability analysis sometimes resulted in deciding to cap contaminated areas. This in fact created the west beach and a clean cover layer of the Eagle Harbor bottom. Other areas at the site had acceptable levels of contamination and were in fact "clean." In the end the community is very appreciative to have a sandy west beach, a covered harbor bottom, forested uplands, and a site for the Japanese American Exclusion Memorial. There now remains the polluted Point and its surrounding shoreline. Fortunately this cleanup is facilitated based on now knowing the general locations of the contaminants.

CHOICE OF ALTERNATIVES

The seven alternatives for the upland cleanup are reviewed and rated by EPA in Reference 1. The final selection should involve weighing the following: 1) extent of cleanup, 2) environmental impact, 3) total cost, 4) time for completion, 5) effect on neighborhood, 6) risks, and 7) probability of success. A similar list of these criteria is outlined in Section 9 of Reference 1 – Comparative Analysis. ABC does not have the expertise to carry out a fair evaluation based on either of these two lists of criteria, but does have members who are qualified based on their professional background. One member who submitted comments is Janet Knox (See Reference 2) who is familiar with the site, and recommended Alternative 4. Another resident who also has a background in the field spoke in support at the public meeting for a version of digging up the soil, heating it to remove the contaminants, and returning the soil on site.

NEED FOR RISK ANALYSIS

As pointed out above ABC originally had a vision that the contamination which meets a "clean" threshold might be removed leaving a "clean" site; however the extent of the contamination and the cost and difficulty to clean it up was not feasible for some cases at the Superfund site. This resulted in leaving the contamination in place — but capped. It is ABC's understanding that this feasibility requirement to clean the Point and surrounding nearshore also will leave some of the contamination to remain at the site but immobilized. Thus we would like to recommend a risk analysis should be added to Section 6 and 9: "Risk - regarding the probability the chosen alternative would sustain some sort of failure, and what the consequences and repair would be." I have served on several boards of scientific societies which carried out risk analysis, albeit with different situations. Risk in Section 6 is defined as health and ecological risk which is of course important. However here I use Risk as it pertains to possible problems which could arise with each alternative. Potential problems should be listed along with an estimate of their probability of occurrence and ramifications. Examples would be if the aquitard were damaged due to a mistake in the depth of the auger, or somehow contaminated water flow entered into Puget Sound during land or nearshore digging. One possibility for a source of risk analysis, including probability, might be to cite similar sites with similar conditions and similar cleanup methods. Given limited data this could be a short analysis, but it would provide the community with EPA's confidence in the various alternatives – many of which probably have similar Risk analyses.

BASELINE

Perhaps the most-asked question ABC receives from Bainbridge residents is whether it is safe to go into the water at the sandy west beach. This beach has become a real destination, especially with the recent warm weather. ABC cites the CDC results and refers them to the July 2009 report by HHS/CDC:
http://www.atsdr.cdc.gov/HAC/pha/WyckoffWoodTreatingFacility/Wyckoff EagleHarborSuperfundSite 7-22-09.pdf

I am not sure if this document has been updated. If it hasn't ABC would recommend an updated report which would serve as a baseline before the cleanup of the Point is undertaken. Repeating the same measurement after all the operations have been completed would assure residents that the cleanup of the adjacent OU site had no effect on the safety of swimming at the West beach.

OTHER COMMENTS

Although there eventually will be many relatively minor details which accompany the chosen alternative, ABC would like to document its thoughts while there is an opportunity.

Noise. ABC recommended that a vibration device be used for the original installation of the sheet pile wall instead of a steam hammer for lower noise levels. This was appreciated by the neighbors, and any noise abatements for the chosen alternative will likewise be appreciated.

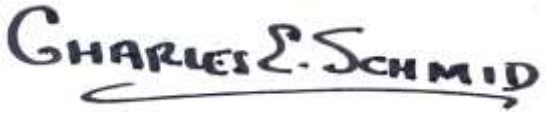
Traffic. The use of barges to transport equipment and materials has been brought up to minimize truck traffic.

Lowering of Sheet Pile Wall. The height of the sheet pile wall could be made lower from its present height, even taking sea level rise into account. Another option would be to slope the beach in front of the wall which will protect small fish which need shallow water to avoid predators. Any design which results in a more natural shoreline in appearance and function would be welcome.

Documentation of Cleanup. The 100 year history of the Creosote Plant has been documented with words and photographs. But there is a 30+ year history of the transition from a contaminated site to a park and national monument which needs to be documented with words and photos. This history would serve not only as a reminder that Superfund sites can be reclaimed, but also the high cost to restore sites could, and can be avoided by simple acts of prevention.

Roads. It appears all the alternatives will require re-routing of the entrance road down to the site from Eagle Harbor Drive and also provide public access to the water. ABC and members of the Pritchard Park Advisory Design Committee would appreciate being involved when the preliminary cleanup designs are drawn up. In addition shaping the terrain of the Point is important – but we realize this is a long way away – but then again the cleanup has come a long way in the three decades.

Thank you for considering ABC's comments, and we look forward to EPA's selection and implementation of one or a combination of the alternatives presented. Also ABC would like to compliment EPA on producing Reference 1 – the fold-out maps and photos were especially helpful in understanding the status of the site.



Secretary/Treasurer
cc: Dale Spoor, President

Corrections to Report

Item 4.2 says "City of Bainbridge Island, which purchased the property from EPA in 2002." Technically speaking I believe the City purchased the land from Pacific Sound Resources Company which was a trust with a trustee. Perhaps you might check with someone at EPA familiar with the Site. See http://www.bainbridgereview.com/news/19678454.html.

Bottcher, Helen

From: (b) (6)
Sent: Wednesday, June 29, 2016 9:03 PM
To: wyckoffcomments
Subject: Comment on Wyckoff/Eagle Harbor EPA Superfund Site Proposed clean up plan

While I do understand the logic behind the recommended option, i believe that finding a means to actually remove the source material rather than encapsulate/stabilization it is desired. In addition, I have concerns about the fate of the plume during the stabilization since I could see it being forced into the lower potable water aquifer. Therefore, I think that upland alternative #5 "thermal-enhanced extraction..." or a smoldering-combustion clean up is preferred since it actually removes the source material from the area.

Sincerely,

(b) (6)

Bottcher, Helen

From: (b) (6)
Sent: Thursday, June 30, 2016 12:15 AM
To: wyckoffcomments
Cc: Skadowski, Suzanne
Subject: Gander Wyckoff Comment #4

Hello Ms. Skadowski:

Please send me a quick reply to acknowledge your receipt of this comment.
Thank you.

The purpose of this comment is to request a revision of the construction of the Alternatives presented in the April 2016 FFS regarding OU2/4. In that document, Alternative 7 (in-situ stabilization/solidification [ISS]) is presented as the preferred Alternative. I present two reasons why a revision is warranted:

1. A statement in the local newspaper by environmental professionals Janet Knox and D. Fehsenfeld point out reasons why Alternative 4, not Alternative 7, should be the recommended alternative because it actually ranks higher than Alternative 7 when using the National Contingency Plan's required Nine Balancing Criteria. I have put their statement at the bottom of this comment.

2. Alternative 6 should be modified - and can be responsibly modified - to bring the costs down to a level where the Nine Balancing Criteria assessment score for this thermal destruction-based Alternative would be higher than Alternatives 4 and 7. As I have explained elsewhere, the permanence element of Alternative 6 makes Alternative 6 the best choice, it just needs to be packaged in a reasonable way. Remember: ISS (whether it's Alternative 4 or 7) is not permanent, and the thermal destruction of Alternative 6 is permanent and is obviously superior in the Long-Term Effectiveness and Permanence criteria rating compared to Alternatives 4 or 7 (i.e., I also note that the Long-Term Effectiveness and Permanence three star rating for Alternative 7 was the same as Alternative 6 in the FFS, which appears illogical-please clarify). The thermal destruction of Alternative 6 destroys the leachate and in the long-term, significantly reduces the Operations and Maintenance costs of Alternatives 4 and 7 and also significantly reduces the project management and administrative costs of EPA/Ecology and their consultants in the long-term management of this site.

The cost of Alternative 6 ($161M) as presented in the FFS is considerably higher than the recommended Alternative 7 ($82M), and Alternative 4 ($89M). However, the Alternative 6 cost can be reduced substantially (for example) as follows:

-<u>Abandon the approximately $10M piece of Alternative 6 that employs thermal enhanced extraction (TEE).</u> This is a version of the poorly-performing steam injection pilot testing research and development adventure of 2003. Yes, we now have lessons learned and the engineers have a new plan to optimize the implementation of this technology at this complex site. I submit that not invoking TEE and simply augmenting the low-cost, passive, slower, but effective enhanced aerobic biodegradation (EAB) for contamination below soils to be treated by thermal desorption is a more responsible use of taxpayer money, i.e., as much money as possible should be used for thermal desorption.

-Abandon unnecessary portions of the $40M Common Elements costs that are not essential to a thermal destruction-based Alternative 6 preferred remedy. Approximately $9-10M can be shaved off the conservatively-constructed Common Elements if TEE is abandoned from Alternative 6, and if the focus is on removal to 15 feet below grade (not 20 feet as Alternative 6 is now presented - see next bullet below); and if the 15 foot removal depth focuses more on hotspots defined in the TarGOST characterization work. The following is a high-level overview of where costs can be reduced:

-$ 1M: Concrete Demolition, Decontamination, and Reuse;
-$ 2M: Sitewide Debris Removal;
-$ 2M: Bulkhead Debris Removal;
-$ 3.4M: Concrete Perimeter Bulkhead Wall (this money can be saved if the construction of the 1,900-foot-long wall is to
30 feet [not 38 feet]);
-$ 1M: New Outfall

-Reduce the Alternative 6 Removal Depth from 20 to 15 feet & More Efficiently Use the TarGOST Data for Hotspot Removal.

Per WAC 173-340-740(6) on page 2-1 of the FFS, applying thermal desorption to the top 15 feet of contamination along with institutional controls can reduce costs on the order of $10M. Costs will be lowered because dewatering challenges are lessened when excavating to 15 feet instead of 20 feet, thereby raising the Implementability criteria score for Alternative 6.

The three bullets above present viable ways to reduce the Alternative 6 costs on the order of $30M. A more detailed engineering analysis can be accomplished along these lines to further reduce costs that will bring the score of a modified Alternative 6 to a point where it becomes the preferred remedy. Revise the FFS accordingly.

Malcolm Gander, Ph.D., LG, LHG

Knox/Fehsenfeld Statement:

"To the editor:

We encourage everyone to submit public comments on EPA's Wyckoff/Eagle Harbor Proposed Plan and Feasibility Study (cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=1000612).

As Bainbridge Islanders and Technical Assistance Grant Committee members, we've witnessed and reviewed Wyckoff/Eagle Harbor's investigation and cleanup for almost 30 years.

As environmental geochemist and technical readers, we recognize the site's complexities and respect the EPA's willingness to reassess the preferred remedy in light of the last 15 years' technological developments, however, EPA needs public comments to encourage them to more completely clean up the site sooner.

We find that while EPA prefers Alternative 7, Alternative 4 would rank higher than Alternative 7 using the National Contingency Plan's required Nine Criteria because Alternative 4 achieves protectiveness in a shorter time frame with less impacts on the community by traffic, noise and road maintenance, returning the site to the community for use as a park sooner.

With Alternative 4, the beach cleanups can be consolidated and treated as part of the upland and then capped.

We strongly recommend seizing two valuable opportunities:

Using designs from the Seattle Seawall Project to maximize the habitat value of the new concrete bulkhead and including bicycle lanes in road upgrades for cyclist and pedestrian safety to mitigate the considerable active cleanup traffic.
Where possible, equipment and materials should be transported by barge rather than by truck via roadways.
JANET N. KNOX AND D. THOMAS FEHSENFELD"

Comment 33

Bottcher, Helen

From: (b) (6)
Sent: Thursday, June 30, 2016 9:30 AM
To: wyckoffcomments
Subject: Bainbridge Superfind Clean Up Comments / (b) (6)

Dear EPA:

First, I want to thank EPA for its ongoing involvement and commitment to this complicated Superfund site on Bainbridge Island. I have lived here since 1983, and have been involved with much of the 30 year narrative to get this site cleaned up, including finding the exposed and infamous Trench 3, full of toxic creosote wastes which a neighbor and I discovered at what was then the County Landfill. Fortunately, a great deal has happened since then, with many technical ups and downs and changes in EPA staff, but we here on the Island so appreciate EPA's willingness to work with our local community and the Washington Department of Ecology to find a permanent and sustainable solution.

I was a member of the Generational Remedy group that met at Islandwood to explore new technological solutions, and have also been on the citizen's committee that has met with EPA and DOE staff to help shape the final recommendations. So I have a pretty fair grasp of the technical issues involved, and understand the basis for your final recommendation of Alternative 7.

But in my further review and analysis of your report and a closer examination of the other alternatives, I have come to the conclusion that the best solution for our community is Alternative 4, not Alternative 7, close as they are in the scoring scales you utilized. The costs estimates are similar, but the key differences for me are the shorter time needed to complete the work which will have a dramatically smaller impact on the community in terms of noise, truck traffic and air pollution, and would allow the site to be used as a park much more quickly. I was also involved with the fundraising campaign to raise the 8 million dollars to purchase the site for Pritchard Park, and like many Island residents who were investors in that effort, we are eager to get this site remediated quickly and completely so Pritchard Park can become whole for the public to use. And any surface undulations that might result from employing Alternative 4 will be easily incorporate in the final design and will not be an issue at all.

Thank you for taking these comments into consideration for your final recommendation.

Best,

(b) (6)
Bainbridge Island, WA 98110
(b) (6)

BAINBRIDGE ISLAND PARKS FOUNDATION

PO Box 11127
Bainbridge Is., WA 98110
www.biparksfoundation.org
206.842.4971

June 30, 2016

Helen Botcher
EPA Project Manager
U.S. EPA Region 10
1200 Sixth Avenue Suite, 900 ECL-122
Seattle, WA 98101

RE: Proposed clean-up plan for Wyckoff/Eagle Harbor Superfund Site

Dear Helen:

The Bainbridge Island Parks Foundation joins members of the community and the City of Bainbridge Island in supporting Alternative 4 of the EPA recommended cleanup options for the Wyckoff/Eagle Harbor Superfund site at Pritchard Park on Bainbridge Island.

As a nonprofit dedicated to enhancing our community by supporting a thriving system of parks, trails and open-space on Bainbridge Island, we feel that it is critical for the existing substantial contamination to be isolated from public contact at this park. The beaches at Pritchard Park are popular and the existing closure areas outside of the area contained by the sheetwall are still frequented by park visitors. Threats posed by earthquakes and increased precipitation due to climate change increase concerns. Since the Feasibility Study predicts that the completion period to be 10 years for Alternative 4 versus 24-34 years for the recommended Alternate 7, we support the former over the latter: so that the park may be safe and accessible for public use sooner. We also support Alternate 4 as it provides the opportunity for a concrete bulkhead with design options similar to the new Seattle seawall: more attractive visually and ecologically than a steel sheet wall. We support Alternative 4 for minimizing the negative traffic and noise impacts to the community.

Along with others in the community, we encourage the remedy to include mitigation for the traffic impacts of the cleanup, including the transportation/delivery of materials by barge, and Eagle Harbor Dr. improvements to accommodate pedestrians and bicyclists. We also encourage the redesign of the entry road to consider future use of the park so as to optimize community use of the eastern bluff of the park, and to provide eventual ADA and improved emergency access to the beach and point at Pritchard Park.

The BI Parks Foundation wishes to express our appreciation for the teams of individuals from the State Department of Ecology and The NW Regional Office of the EPA for their dedicated and extensive efforts to find a feasible and permanent solution to remedy the toxic contaminants at Pritchard Park. Your efforts prepare this site to be a spectacular gateway park for the enjoyment of generations to come.

Thank you,

Barbara Trafton
Executive Director

Comment 35

Bottcher, Helen

From: (b) (6)
Sent: Thursday, June 30, 2016 12:34 PM
To: wyckoffcomments; (b) (6)
Subject: Comments on Wyckoff Proposed Plan

Dear Ms. Bottcher:

We collectively own and live in two properties near the Wyckoff Superfund Site (b) (6) .

We have reviewed the Proposed Plan and associated Focused Feasibility studies for the Wyckoff/Eagle Harbor Superfund Site.

Our main concern is EPA's selection of a cleanup alternative that greatly elongates the cleanup schedule and delays the creation of public space. The selected alternative appears to implement the remedy in two phases, with a concomitant increase in duration until remedial completion. However, Alternative 4 in the Focused Feasibility study has a much shorter implementation phase, and relies on a more extensive use of in-site stabilization and solidification (ISS, the same technology applied in the preferred alternative).

Importantly, the costs appear similar ($88.6 million for Alternative 4 and $82.4 million for the selected alternative, according to the April 2016 Focused Feasibility study (0U2/OU4).

Most relevant to the Bainbridge community and our neighborhoods in particular is the much shorter duration to potential redevelopment of the space as a public park. Alternative 4 appears to have a 10 year remedy implementation phase, whereas the selected alternative will require 23 years of remedy implementation. Furthermore, the selected alternative requires another sheet pile wall to be driven outside the existing sheet pile wall, which is extremely noisy to residents in the vicinity.

Given the similar costs, but drastically lower time to remedy completion, and the reliance on similar technology (ISS), this does not make sense. Why should the community suffer through an elongated construction project, on the off-hand chance that Phase 2 of the remedy is not necessary or can be scaled back? The difference between potentially having a public space for community space after 10 years, versus 23 years, is enormous – and for some of us, means we may never have an opportunity to enjoy the space.

We strongly encourage EPA to reconsider and select Alternative 4.

Sincerely yours,

(b) (6)

(b) (6)

Bottcher, Helen

From: (b) (6)
Sent: Thursday, June 30, 2016 12:27 PM
To: wyckoffcomments
Subject: Wyckoff Eagle Harbor clean up

Please consider a more permanent solution for Bainbridge Island Wyckoff Superfund site, not cement solidification. Eagle Harbor needs to be free of contamination. Clean forever, for many generations.

(b) (6)

Bainbridge Island, WA

Sent from my iPad

Bottcher, Helen

From: (b) (6)
Sent: Thursday, June 30, 2016 1:22 PM
To: wyckoffcomments
Subject: Comments on Wyckoff/Eagle Harbor Superfund Clean Up Plan

To: Helen Bottcher, Project Manager
U.S. EPA region 10
1200 6th Avenue, Suite 900 (ECL-122)
Seattle, WA 98101

Dear Helen:

My name is (b) (6) and I live in Eagledale, two blocks up from Pritchard Park. We have been active park users for the last 12 years and I am currently on the trails committee (for Pritchard Park) with another neighbor, (b) (6) We would like to add our voices to the many in support of Alternative 4 of the EPA recommended cleanup options for the Wyckoff/Eagle Harbor Superfund site on Bainbridge Island.

It is critical to contain the existing substantial contamination at Pritchard Park. The beaches at the park are popular and the existing closure areas outside of the area contained by the sheet wall are still frequented by park visitors. Threats posed by earthquakes and increased precipitation due to climate change are cause for concern and caution. We have studied the options, spoken with EPA staff and contractors, island scientists and engineers and our neighbors and feel that Alternative 4 offers the best solution for the community and for the environment. The Feasibility Study predicts that Alternative 4 versus could be completed in 10 years, whereas Alternative 7 was estimated at 24-34 years. Although the upfront costs would be greater, Alternative 4 would ultimately be less expensive in both time and money. The concrete bulkhead design (with options similar to the new Seattle seawall) would be more ecologically sound and more attractive than a steel sheet wall. We also think that Alternative 4 would minimize the traffic and noise and congestion, and their negative impacts on the the community.

Previous clean up efforts at the site have minimized traffic impacts by relying on transportation/delivery of materials by barge which made a big difference to the community. Accommodations were also made, and improvements to Eagle Harbor Drive that allowed for continued use by pedestrians and bicyclists. Any redesigning of the access road will need to consider future use of the park to optimize community usage of the eastern bluff of the park - gateway to the harbor and views east to Seattle and the Cascades. This area will also need to plan for eventual ADA and improved emergency access for Pritchard Park.

We deeply appreciate your dedication and hard work, both the State Department of Ecology and The NW Regional Office of the EPA, developing a feasible and permanent solutions for the toxic contaminants at Pritchard Park.

Your efforts will make this place healthier and more beautiful, for all of us - thank you!

(b) (6)

Bainbridge Island, WA 98110

Comment 38

Bottcher, Helen

From: (b) (6)
Sent: Thursday, June 30, 2016 2:08 PM
To: wyckoffcomments
Subject: Alt 4

Ms. Bottcher,

As a neighbor of the Wyckoff superfund site I would strongly urge you to consider Alternative 4 for the clean-up of our neighborhood beach.

Sincerely,
(b) (6)

6/30/2016

Public comment on the Proposed Plan for Amending the Records of Decision for the Wyckoff/Eagle Harbor Superfund Site (Operable Units 1, 2, and 4) on Bainbridge Island

Thank you for the opportunity to contribute comments on the alternatives proposed to treat or extract the NAPL at the old Wyckoff wood-treatment facility.

As a resident of Bainbridge Island I am concerned about the alternatives presented for treating the NAPL contaminated area at the Wyckoff Superfund site, particularly for the upland area. One of my biggest concerns regarding these alternatives is protecting the underlying aquitard, which is very thin or not present in areas (e.g., southeast upland region, Figure 1-11 reference ** below). **My vote is for the alternative that maximally extracts NAPL, is least intrusive to the aquitard, and does not rely on the sheet pile wall to contain the contaminated ground water.** Also, I am concerned about the new sheet pile wall. The current one is likely to fail within 10-15 years, and according to Figure 1-3 (reference ** below), the wall is approximately 60 ft deep. The new wall design is for 30 ft deep (alternative 4) or for 38 ft deep (alternatives 5-7). Does the new wall tie into the old wall? Given the amount of deep NAPL, it seems conservative to design the new wall to match the old wall in depth, plus make the new wall resilient to earthquakes? Which alternative would protect the public and wildlife from NAPL contaminants (non-aqueous and aqueous) in the event of an earthquake?

My concerns regarding the different alternative options:

Option 4: The ISS methodology (also in options 5 & 7)
1) does not remove the contaminants,
2) has a shallower Sheet Pile Wall (30 feet) than options 5, 6, and 7 (38 feet deep),
3) has a questionably high percent of NAPL treated (93%); this high percentage is unlikely due to the depth of some locations, debris (including glacial till), and geometry. By geometry, I am referring to the round bore holes, which would leave surrounding areas untreated. Do the untreated areas add up to 7%?,
4) intrudes on the aquitard (Fig 1-8; see reference **below),
5) is permanent, which makes additional treatment of the upper aquifer very difficult, and it
6) would make the lower aquifer inaccessible to future cleanup actions.

Option 5 and 7: The mixed models of using ISS and extraction seems more reasonable than option 4, yet for the same reasons listed under option 4, there are drawbacks, most especially-- the risk to the aquitard, where the aquitard is thin (preliminary drawing: ISS isopatch, pg 213 in reference ** below); the suggested revision of the steel wall to be built on the outside of the current wall does not state a depth--- what is it?

Option 6 is the most desirable option: This approach extracts the contaminants, and I think that this approach is least intrusive to the aquitard. By removing the contaminants, there is less reliance on the Sheet pile wall to contain the aqueous contaminants (consider a possible earthquake). Plus, the individual treatment locations provide placement flexibility.

**Non-Aqueous Phase Liquid Focused Feasibility Study for the Soil and Groundwater Operable Units (OU2/OU4) Wyckoff/Eagle Harbor Superfund Site, Bainbridge Island, WA

Thank you,
(b) (6)

Comment 40

Bottcher, Helen

From: (b) (6)
Sent: Thursday, June 30, 2016 2:31 PM
To: wyckoffcomments
Subject: Comments on Wyckoff/Eagle Harbor Superfund Clean Up Plan

To: Helen Bottcher, Project Manager
U.S. EPA region 10
1200 6th Avenue, Suite 900 (ECL-122)
Seattle, WA 98101

Dear Helen:

My husband, (b) (6) and I, (b) (6) live a block up from the Wyckoff/Eagle Harbor Superfund site on Bainbridge Island. We are frequent users of the Park.

We strongly urge the selection of Option 4 for the Superfund site's next effort.

Thank you,

(b) (6)

Bainbridge Island

Comment 41

Bottcher, Helen

From: (b) (6)
Sent: Thursday, June 30, 2016 4:16 PM
To: wyckoffcomments
Subject: wyckoff comments

I am voting for alternative 6 as the best longterm solution. I am concerned about what happens when there is an earthquake and want a solution that solves the problem of toxic infiltration of aquifers, the sole source of drinking water for Bainbridge Island. Currently a water treatment plant run 24/7 keeps toxic pollutants out of the aquifer. I want a solution that does not require the treatment plant from here to eternity, especially when EPA turns management over to the state of WA over the long haul. i am a (b) (6) of Bainbridge Island and I have been following the Wyckoff superfund site problems for all those years. Thank you for taking my comments into account.

(b) (6)

Bottcher, Helen

From: (b) (6)
Sent: Thursday, June 30, 2016 4:24 PM
To: wyckoffcomments

Dear Helen, Though I live in Winslow I'm a frequent visitor to and admirer of the Pritchard Beach and area, paddling often in my canoe and landing there. I strongly urge adoption of Alternative 4 which seems so clearly the best solution for the island Sincerely, (b) (6)

(b) (6)

_ \ <, _
..... (•) / (•)

Comment 43

Bottcher, Helen

From: (b) (6)
Sent: Thursday, June 30, 2016 4:27 PM
To: wyckoffcomments
Subject: Wyckoff Super Fund Clean-Up/Comments

Dear EPA:

The previous efforts at clean up have been not been effective. The tar balls still appear on the shore and the latest solutions also seem headed for failure. Why? Because we're not really removing the toxins!

It is my hope that we will not spend close to $100 million bucks to stuff concrete down tubes where it will probably escape again - soon and contaminate the beach.

As I read some of my community letters - I've seen a solution that seems to get to the heart of the issue and would go a long way to resolving the toxic issues. Simply - dig up the tar and burn it. Remove it forever. Don't truck it away to contaminate yet another piece of land. Dig it up and burn it. Then, remediate the remainder until we finally get it out of the Harbor.

The beach is not safe for children or animals but people are so desperate for a stretch of beach and because no signs have been posted - they use it anyway.

Let's clean it up for ourselves and the next generation. Time to take a BOLD step here.

Thank you,

(b) (6)

Comment 44

(b) (6) [redacted]

June 30, 2016

Helen Bottcher, Project Manager (ECL-122)
U.S. EPA Region 10
1200 6th Ave., Suite 900
Seattle, WA 98101

wyckoffcomments@epa.gov

SUBJECT: Eagle Harbor Superfund Site – Public Comment, Proposed Amendment to ROD, April 2016.

Dear Ms. Bottcher,

Thank you for your frank phone conversation earlier this week. I regretted not attending our citizen committee's March meeting or your presentation at City Hall. I appreciate the comment deadline extension and wish I had more time.

Everyone on our citizen committee brings a different viewpoint to the table and a different area of expertise. I do not think anyone on the committee possess the length of oversight as do Charles Schmid and I. And in some ways, not even Charles.

Personal perspectives and viewpoints:

Where I've lived:

(b) (6) [redacted]

I have been a life time resident of Puget Sound and Salish Sea except for inland college years in New England (NH, MA, VT) plus NYC and Long Is. Sound, NY) and maritime travels to Australia, NZ, Japan, Korea, Bermuda, B.C. Canada, US West Coast (WA, OR, CA, AK & HA) and inland France. A Scout Jamboree troop crossed US in ’57.

I spent summers my Tom Sawyer years in 1940s and early ‘50’s becoming very familiar with people and marine life on north shore of Port Madison between Miller’s Bay and Jefferson Head on the Port Madison Indian Reservation. We beach combed shores, explored tide flats, fished endlessly from Indianola Dock and played among its pilings and critters at low tide. I spent three years studying biology especially marine biology and zoology in an advanced high school program that included UW’s Oceanography program and bottom trawls in Port Madison.

Education:

(b) (6)

(b) (6) My education was also affected by Scouting, The Seattle Mountaineers and REI – an organization my father co-founded. I carry card no. 16.

My marine science interests were greatly enhanced by (b) (6) (b) (6) lifetime friendships and mentors. I have followed the development of aquaculture here since being an age 3 neighbor, Scouting friend and lifetime friend with (b) (6) (b) (6) former director of NMF Research Labs at Manchester and one of few scientists on Governor’s Fisheries Commission. My late-aunt was a marine biologists and by uncle an oceanographer and meteorologist. They both became Master Gardeners and my aunt, county Audubon Society president after retirement. (b) (6) (b) (6) was a close friend and one of the top local Naval Architects, having designed several State Ferries and more. For WSF, he oversaw events and rescues following the grounding of the Walla Walla Wing Point in the channel across from Creosote. Danish

designer (b) (6) amplified much of what we learned about the sea through sailing, as did several captains with whom a sailed or served.

(b) (6)

(b) (6)

Is. School District. I have also served the Suquamish Tribe formally twice – as educator and as marketing consultant for their first Museum founded by some of my former students. I've co-authored two books on Suquamish history and helped the Tribe in many ways.

Mariner

In maritime fields, I have served as a seaman on Washington State ferries for crews whose assignments included sea trials of new ferries of HYAK class as well as pressing historic oldest ferries into service during busy summers; and we served as helmsman and deckhand on a large towboat to AK via Inside Passage, and helped pioneer the State's geoduck harvest industry serving as dive tender, dive boat launch operator, dive training, and worked among shellfish harvesters and marketers. I coordinated shipping the first live clams to Tokyo.

Shellfish and Marine Algaes

I began growing oysters "non-commercially" in Eagle Harbor in 1973 near the Head-of-the-Bay and continue to do so. One of the Island's first four WSU "Master Gardeners" who grew much of our young families food for 20 years

I have scuba dove in Eagle Harbor at Wing Point as well as under and around the Winslow Ferry Dock. All my life I've harvested crab, not with traps but by wading, day and night, at low tide among the sea life and observed the ever-changing ecology. I was on the small select survey team with Paul Dorn and Suquamish Fisheries launch and City staff who used GPS to survey every creosoted pile and timber on east side of Island and in Eagle Harbor.

We have harvested nori, Laminaria (kombu) Nereocystis (bulb kelp) and other seaweeds for years for human consumption and garden soil enhancements. Every year or two we make kelp pickles from kelp at harvested at Wing Point. You might like to try some. Their label would make you smile.

Municipal government environmental oversights

I also had experience in municipal government, solid waste management, sewerage treatment upgrades, landfill creations and garbage dump land reclamations as an assistant to the Mayor and recording clerk for the City of Poulsbo for five years during their "Trident Growth Boom", 1975 to 1980. We shared the same City Engineering firm, with the City of Winslow and became good friends with chief engineer (b) (6) ho was also working on secondary treat plant improvements and outfall location studies in Eagle Harbor for Winslow. These included current flow and circulation studies on a full range of tide extremes.

Historic Preservation

My participation with most recent EPA citizen group – and I've been on others – stems from my long time interest in Island and regional history.

(b) (6)

treasured time with old timers, some of whom had known my ancestors. I learned about theirs. I served as a trustee with the

County's historical society and the Island's; I embraced Friends of Suquamish Museum, BI Japanese American Community's Heritage Steering Committee, and became an honorary lifetime Filipino American. I wrote an environmental history of the Island told through water (*Streams of B. Is…"* (1996, Salmonberry Press). We formed "Friends of Kitsap Archaeology" and more recently "Friends of Geology" both for professionals and geology educators. We taught two college credited summer courses for teachers. I received three Governor/SHPO awards, a (rare) National Historic Preservation Award (DAR 2000) and became the Island Arts & Humanities Council's first recipient of their Island Treasure Award in Humanities all because of our interest in historic preservation in a community rich in history.

Creosote

And in the middle of all this, the last owners of the wood preservation industry with locations near the mouth of the Duwamish River and at Bill Point on Eagle Harbor decided to cease operations. I'd known some who worked there including a kind old fellow across the road from us whose small farm had creosoted fence posts as he had once been plant superintendent – Jacob Book. We all took advantage of free bark chips in home gardens and composted with aquiculture fish mortalities for commercial farms' compost additions to our glacial soils and poles for any community project that needed them. We joined volunteers using them to build the park districts first children's playground. And I once put on shirt and tie and visited their Island offices to explore job opportunities. I should have worn caulks and swapped the tie for a can of chewing tobacco.

When I saw that the young team who were put together to plan and execute the cleanup at Wyckoff were young and cared little about the history and were making some foolish mistakes because they had not taken the time to learn about the industry and its products and uses, and because there was interest in adaptive reuses for the industrial buildings and historic offices and residences, and or some significant artifacts for use in interpreting the Creosote community's history for future generations, we had to do something. When we heard that throughout the west whenever EPA cleans up a site whose engineering had not been surveyed and documented for historic

preservation purposes while Creosote's was not and had not been, we spent six-months intently interviewing all of the former employees we could find, gathering their oral histories and interviews as best we could, collected historic photos from many varied sources known and mostly heretofore unknown to tell the story. We gained access to company files and with help of site overseers of various employs, saved the only surviving Army Corps of Engineers Map for Eagle harbor that had been made in 1904. Neither Seattle Corps offices nor National Archives had it.

We accessed files with hundreds of recipes for the creosote mix for pilings designed specifically for different cities and environmental demands.

We found films of the plant operation of the sister plant in Seattle on the Duwamish. We found old company products records in our museum archives with photographs of each and many of their locations. And they were amazing and revealed, by EPA decisions being made, that they had not done their homework.

We created a doubled slide projector slide show to enable a sharing of three remarkable panoramas of the Creosote community that was, until 1936, completely waterborne and had its own post office.

We invited the Island to a sharing of that film and slide show that contained 250 images and made sure as many of the old timers as we could find attended. This were people who'd spent their lives in the town of Creosote and had lived in no small part from the clams on the beaches there, catching crab and shrimp from the beaches, swam in the surrounding waters, rushed to the retort openings whenever they had a sinus congestion in order to breath in the hot creosote smells that relieved their congestion, and yet despite all claims to the contrary thought by environmentalists to not be possible, their cancer rates where not above the population norms.

My time is running out for comment but I would like to say that these folks had not been idiots. Their leadership came from the top engineering graduates the UW produced. The detail with which they produced street pavers, railroad ties by the barge full was not rocket science so much as the piling precision. And these were nothing

compared to the unbelievable trestles and bridges that had to not just be made all drilled and everything to be taken to the construction sites to cross irregular ravines and vallies, curve at often irregular radii and gain or lose elevation as they crossed and each piece of these timber framed works had to be designed and loaded and shipped and unloaded precisely as they had to be assembled, each piece labeled and marked, pre-assembled before pressure treatment to make sure everything was coated and all would fit on site. I dare say that is every bit as challenging as a proposed plane dated April 2016 to continue the 29 years of “cleanup” at the site for what, another 16 years?

I am running out of time today.

(b) (6) problem-solving offering would with time have ons that deserve to be asked and should have been heard, but were not. When the Wright brothers designed the airplane, they took opposite sides or viewpoints to design ideas every other day. These dates led to human winged flight.

I see or hear no such debates yet assume EPA staff must have them. I was pleased by your frank sharing this week on the phone. I was also pleased with my listening and not streaming on, as this writing must seem. I admire the challenges EPA must face on a daily basis. Humans have not faced challenges quite the same as these in history. Yet the former Creosote workers felt they were saving trees and forests, save labors with long term use of materials, finding uses for industrial byproducts – creosote – that would have been used how.

A double PhD chemist in our State disagrees with toxicity issues surrounding Creosote and is hired by Canada to over see that nation’s use of treated piling. We know for sure that vertical columns of marine communities ecosystems enhance the biodiversity. Barren sand undersea plains are comparative deserts to piling forests of algae, shellfish and all manner of flora and fauna and invertebrates.

Our Creosote History program that told the industry’s story should have been the first thing EPA and our citizen committee sat down to see and think about.

When the machine shop with its foot thick timber framing was declared that it had to go because its floor contained creosote, EPA workers had no knowledge of the recipe for the floor tiles that had the least amount of creosote on any of the company's products. More embarrassing was the fact that federal employees of the Bremerton naval Shipyard were working on that very same floor and still are today I believe because that is and was the best floor to protect machined materials from breakage in case it is dropped. Further, today at the Seattle Center House, the same creosote pavers that are the restored floor of the former Armory that formerly had occupied that very spot is the dance floor and main dining room thousands of visitors use every day! And at the time, REI's floor on Seattle's 11th Ave also used the same floor.

We hurried a video copy of our Historical Society's program, "Creosote Sunday" at which everyone was served homemade vanilla ice cream topped with creosote (chocolate sauce) and sawdust (peanuts) and the salute to the families who devoted their lives to – oh, and I forgot the enormous water transmission lines and wooden creosoted treated pipe that carried water from Seattle's mountain reservoirs, four-foot diameter ones still being used at the time of our program (!), and piers and docks and everything from the Panama Canal to the largest port in Asia

The (b) (6) co-founder of Arts & Crafts, the organization who had lobbied to initiate a school art program. Their chief engineer was on the park board and not many years after my visit, oversaw the $2M bacteria creosote digestion tank and wells built by Wyckoff to extract the creosote contained in the subsoil. I have always felt that there is merit in biological cleanup remedies.

We sent our program video to DOI and NPS headquarters in San Francisco which brought a temporary halt to the cleanup while a trained cultural resource expert rushed to the site that was by then maybe 75% demolished and did an Historic American Engineering Report or Survey. The ca. 20-foot or so section from one of the eight 130+ foot seven-foot diameter retorts was the only artifact except maybe a wrench that had been used to tighten the retort's door, were among the few artifacts set aside for future interpretation. It weighed

17-ton and EPA generously coated it in epoxy or fiberglass resign and transported it to the museum in Strawberry hill Park to await cleanup and eventual transfer back to the site where it was used and should be for proper interpretation.

There was one exception. We did get one more thing. Finally, on the last day before the last major building was demolished, the machine shop, we were allowed to take a look in the shop's attic for anything historical. It had been off limits and frankly overlooked by EPA overseers despite our regular requests since we'd surveyed other buildings. . There we found along with other dusty and dirty rolled near century old documents were the original drawing for a creosote treatment plant at Bill Point. That should have been the first thing anyone did to have a close look at and understanding of the Creosote operations.

Personally noteworthy – Environmental impacts and family loss

(b) (6)

OSHA did not include cancer as an occupational disease at the time. Two years later, NIOSH included benzene among leukemia causers. In time, WSDOH health officials and others noted leukemia clusters in our State (Lynden, WA) and a UW chemistry professor and many, including EPA, noted impacts of methyl bromides which, though outlawed worldwide, continued to be used as fumigants and are even promoted for soil sterilization in CA and here in recent years among berry growers (whose activities here since 1908 I have studied thoroughly).

NOTE: In 1993 (b) (6) an EPA official pointed out that the fumigated shipping container hazards could be eliminated by a modification to container designs to make them tighter so that 100% nitrogen could be used in them instead of the powerful toxic

fumigants; and that the technology to do so is already known here. It has been used by the apple industry for years that remove oxygen from their storage units to retard rotting and enabling long storage of their apple harvests.

QUESTION: What fumigants are used today by shippers?

PROPOSED ROD AMENDMENT:

I am down to 70 minutes to address this and get it in the mail. So much for spell check.

I have many questions – many.

I am not sure after all these 29 years of looking at this problem and even seeing the depth of inquiry and dedication by our EPA, Ecology and USAC teams and associated contractors and sub-contractors, a few of whom I served as consultant or whose frustrations I heard after they walked away from this cleanup challenge.

I am glad that finally the Wyckoff site in Seattle on the Duwamish is getting the attention it deserves. It is in a dense urban area. It has actual salmon runs. It should have had EPA's attention from the beginning.

You will never be able to clean up the Harbor bottom.

Eagle Harbor is not a deep-water harbor. And it runs E-W because it is on the northern edge of the Blakely Harbor Formation, AKA the Seattle Fault. I am very familiar with this and have not heard any USGS reports on its impacts, especially on the current proposed amendment that involves cement, etc.

The depth of the harbor maximum 50 feet in one small mid harbor spot. Mostly it is in 30-foot range or so. One State Ferry used to have a 15-foot propeller – 15-feet! While ferry and boat speeds have been reduced – a good thing because of the complex drift cells and shoreline hydrology and high energy along Rockaway Beach, The ferries glide across this shallow bay until they reach the ferry dock. And as all ferry docks, their length defines the shallowest place where

all ferries go. Further, while they relatively glide until they get to this shallowest spot, once they arrive, the sit there for 20 minutes or so, each hour churning the bottom as their engines are often necessary because of current wind and such to power them against the dock as cars unload. And all that time they are digging a hole. Since we first capped the harbor bottom in response to Dr. Rah's (spelling?) report of effect of AH's on flounder liver lesions, the bathymetric maps of the harbor were changing every month or so.

The depth off of the dock is less than 35 feet. The tide range is 15 feet. The ferry prop diameters place the source of the prop wash very low especially at low tide, but even normally. Even with heavy rocks, I'd be surprised if a cover can prevent the erosion of bottom capping.

The beach at Creosote today appears healthy with small amounts of random seepage. And it looks much the same as it did 29 years ago in intertidal zone. I have boated in the harbor for longer than I have grown shellfish – all in small boats, dories, a canoe, a 17-foot centerboard sloop. I've waded portions of the bay at extreme low tides, frequently when crabbing and working on various projects.

When we were working on establishing a park near the head-of-the-bay we had new varnish clams growing in beach sand and gravel, they came back OK to eat. Similar tests by other groups growing oysters from bags suspended from docks also came back clean. And when reporting it to a WSDOH shellfish specialist he reported similar results fro shellfish samples at Wing and Bill Points and Port Blakely.

What was the source of the Creosote in OU3? Where exactly was it located? How deep? On which side of the ravine swale from Bill Point Hill?

How deep is the City well on Taylor Ave.? That is close to OU3.

How deep is that well? How often is it tested?

How does it compare to EPA/DOE's newer well in Upper Beach area behind fence?

I have no more time but want to thank you for your time and dedication.

I wonder now more than when the cleanup began whether we will actually be able to do better than what Nature would do his or herself.

One remedy put forth, and it may be the ROD we are still using, indicated that the creosote still left in the ground was the equivalent volume as a football field plus end zones three feet deep in creosote. Is place within 50 gallon drums, at the rate of extraction that the process being used was doing, it was going to take over 400 years – I recall 410! Does anyone know what bacteria would do naturally in that time? Does anyone know what the sea level will be in that time? Does anyone know if the United States or EPA will still be around in that time?

Bring your folks over here sometime and let's explore the questions?

I hope the Oregon desert is being cleaned up where we hauled the gad-jillion cubic yards of creosote laden soils from the main contaminated area.

I am vey apprehensive about the concrete slurry suggested remedy as it likely precludes other possible remedies such as may present themselves in today's rapidly changing world? Will a bacterial remedy be possible in a cracked or uncracked cement blob?

If you still want to visit the site on minus 2.9 July 4, I'd forsake other activities.

If you or your staff ever wants to view the slide show you have two choices:
See DVD # 55 at Island Historical Museum, or give me a call.

If this site can be cleaned up, will it be worth the expense to tax holders?

What is the cost to date? $150M? More? Less?

Just time for a short spell check, apologize for ramblings, and to hit e-mail send button.

Cheers and gratitude!

(b) (6)

Bottcher, Helen

From: (b) (6)
Sent: Thursday, June 30, 2016 9:26 PM
To: wyckoffcomments
Subject: Comments on Wyckoff/Eagle Harbor Superfund Clean Up Plan

To Helen Bottcher, Project Manager

My name is (b) (6) and I have lived 40 years on (b) (6) Bainbridge Island 2 blocks up from Pritchard Park. I and my family have been park users for 40 years. And certainly have seen amazing changes! We would like to add our voices to the many in support of Alternative 4 of the recommended cleanup options for the Wyckoff/Eagle Harbor superfund site on Bainbridge Island.

Thank you.

(b) (6)

Sent from my iPad

Comments – June 30, 2016
Recommend New Remediation Alternative A (Modified Alternative 6)

The proposed EPA Wyckoff Superfund Site Remediation plan Alternative 7 is not acceptable for the health and safety of Bainbridge Islanders, Western Washington Citizens, or the health of the Puget Sound. This solution is a cheaper faster way to transfer the costly long-term generational problem and steep liability from the Federal EPA to the State, and ultimately to the citizens of Bainbridge Island without properly addressing or containing the cancer causing hazardous waste contamination onsite. Nor does this selected solution adequately meet with the criteria of EPA's Sole Source Aquifer Designation protections associated with the Island's limited groundwater supply.

The question remains what financial ruin could this less acceptable proposal spell for the citizens of Bainbridge Island and future generations? What damage could this easier faster less costly hand off approach do to the limited groundwater supply already impacted with cancer causing contamination in this area of the Island? What will the ultimate long-term adverse health consequences and exponentially greater financial costs look like for citizens when putting off properly eliminating the source of ongoing contaminant migration?

Is this temporary proposal more about making it look good sooner so the looming hazardous Superfund Site every commuter and future home buyer passes everyday on the ferry, can be dismissed easier for the development and profit interests at city hall aligned with the real estate cottage industry on Bainbridge Island? Citizens and property owners of Bainbridge Island are the ultimate losers to the political pressures to do a faster feel good option without utilizing permanent removal solutions available with the Thermal Destruction (TD) of the contamination. TD technology is a good start to halting the ongoing migration associated with over 85 thousand cubic yards or 131 thousand tons (just in the top 20 feet in the problem area) of cancer causing contaminated soils and groundwater associated with the Wyckoff Superfund Site in Eagle Harbor on Bainbridge Island (contaminants including PCP and dioxins/furans are co-located with the PAHs, and the PAHs are present primarily in NAPL).

Perhaps if there were laws, ordinances, and requirements for disclosure for all real estate transactions on Bainbridge Island outlining the community health and limited water supply impacts from the Wyckoff Superfund Site, the EPA would be more inclined to address the remediation efforts with long-term permanent solutions. Solutions that will actually be more cost effective in the long run, and will make a difference in the health and well being of the community.

Tens of millions of taxpayer dollars were spent to complete TarGOST studies and reporting, to define the extent and depth of contamination at the BI Wyckoff

Superfund site. EPA should honor the work of their former colleague who dedicated himself to these studies before he passed away. The EPA should use the costly TarGOST hot spot delineation studies to address the most contaminated areas with Thermal Destruction, instead of solidifying the contamination in place with unproven short-term cement slurry technology.

Problems with the Insitu Cement Solidification Stabilization (ISS)

1. Not a permanent solution. Thermal Destruction (TD) is proven technology that can eliminate hazardous waste permanently.
2. The ISS technology is not proven technology, especially for a site of this magnitude, with brackish (saltwater) saturated glacial soils starting 7 feet below the ground surface, with tidal, storm surge, and wave action influences.
3. ISS technology has never been used to the extent proposed at Wyckoff.
4. Most ISS sites are on the order of 20 years old, therefore the technology is yet to be proven to last as long as the EPA has suggested.
5. There are documented equipment failures and auger refusal for the proposed large borehole drilling and mixing equipment on other projects. Due to the glacial lithology, there will be significant equipment challenges associated with drilling to the proposed depths of 50 feet plus and borehole circumference. The ability to drill to these depths with such a large borehole, and then adequately mix cement slurry to properly encapsulate the hazardous waste (boulders gravel, clay sand) is questionable. Will it end up like the Seattle Tunnel project, with years of Mini Bertha delays and costly equipment failures, resulting in a less than satisfactory outcome at two to three times the cost?
6. No other site has the shallow brackish groundwater/seawater intrusion issues when injecting cement slurry into large boreholes. Therefore there is no accounting for how cement slurry will solidify completely in brackish saltwater that starts at approximately 7 feet below the ground surface at the Superfund Site.
7. How will the proposed cement slurry solidification in brackish saturated contaminated glacial soils hold up to a 7.0 earthquake, knowing we live along the youngest major fault (1100 years old) mapped in the Seattle area that bisects Bainbridge Island?
8. There is no other site that can account for the longevity of concrete slurry injected into saltwater saturated contaminated soils at these volumes. How long did the concrete Viaduct in downtown Seattle, finished in 1953 with metal support structures, last before it had to be replaced? Considering it was badly damaged in the 2001 Nisqually earthquake, and had to be reinforced, less than 48 years. Realizing the viaduct concrete was not injected and cured underground in saltwater saturated contaminated glacial soils as the EPA proposes for the Wyckoff Superfund Site.

Concrete technology has a limited longevity for any project, especially for those underground in brackish saturated soils.

9. The EPA sheet pile wall constructed onsite to impede the migration the hazardous wood preservative chemicals was projected to last 50 years, it corroded and is leaching contamination less than 15 years after it was installed.
10. The EPA spent millions on the failed steam injection pilot test. Are there ISS pilot tests for the proposed depth and borehole circumference planned at Wyckoff before dedicating the project to ISS technology? No.
11. ISS is an irresponsible approach as it leaves the problem to our children and grandchildren when the concrete degrades and allows for pockets of contamination to migrate and disperse further into the environment and aquifer.
12. This technology will most likely force the hazardous waste deeper into the aquifer as it is displaced by concrete slurry, contaminating the limited groundwater further. Contaminants have been displaced like this at other ISS projects.
13. The enormous costs proposed are for a short-term fix only.
14. When the solidification concrete such as it is degrades, the costs to remediate/manage the site will be exponentially greater to address the thousands of tons of degrading contaminated concrete slurry that was added to the site, above and beyond the large contaminant mass that currently exists at the Wyckoff Superfund Site.

The EPA should reevaluate the Remediation Plan Alternative. Recalculate the biased interpretation for rating the short term Solidification higher than the permanent Thermal Destruction with the 9 point criteria to properly rank the permanent solution as the obvious choice. Modify Alternative 6, Call it **Alternative A**. Prioritize Thermal Destruction (TD) as opposed to Insitu Solidification Stabilization (concrete slurry injection) ISS, for the most obvious hot spot zones defined in the TarGOST studies. Include other technologies to bolster TD remediation efforts. Applying several different technologies will assure a greater level of success and allow for dealing with site-specific challenges and problems. Use ISS on a much more limited basis in areas of the site along the perimeter of TD designated cleanup areas. Avoid encasing the surface above where the ground water and aquitard have been compromised by cancer causing contamination documented in EPA reporting.

The EPA can utilize thermal destruction as the lead primary remedial technique. Designate a minimum of 50%-75% TD remediation efforts to TarGOST hot spots. Consider carefully where less than15 to 25% ISS is appropriate on a limited basis. Again, the ISS technology should not be used in the areas of the project where the contaminant mass has migrated and impacted the aquifer and underlying aquitard, in order to allow these areas to remain open and available

for future technological remediation advancements. Avoid sealing off or effectively pushing contaminants further into the aquifer with the cement slurry as seen in other projects. Utilize and perfect Steam Injection Thermal Enhanced Extraction (TEE) in appropriate areas, as well as Enhanced Aerobic Biodegradation (EAB), which is more passive and slow, to overlap and complement TD and lesser amounts of ISS. Since all of these technologies have varying degrees of success in the right environment with the right application, applying several modalities for remediation would provide for a more successful outcome.

If EPA blunders forward and solidifies hot spot areas with ISS technology, the community loses the ability to apply new and future technologies to manage and remove necessary contaminants at a later date. The EPA should act responsibly and leave the area open to other remedial activities without forcing the contamination further into the groundwater aquifer and complicating the site with thousands of tons of contaminated concrete slurry. As the ISS degrades the costs to remediate will be exponentially greater because the community will be forced to remove the thousands of tons of degrading contaminated concrete slurry that was added to the site, above and beyond the already large contaminant mass that currently exists at the Wyckoff Super Fund Site.

There are some noteworthy politics and history behind the citizens of Bainbridge Island becoming the owners of the large Wyckoff Superfund Site before it was properly remediated in accordance with Federal and State laws to protect human health and the environment, including the ongoing impacts to the limited groundwater supply on the Island. Back around 2008 Christine Rolfes, who at the time was on the Bainbridge Island City Council (now a State Senator up for reelection), along with former Council member/Interim Mayor, and home rule champion, Attorney Andy Maron, Chair of the Open Space Committee at that time, and others, convinced the rest of council and prominent members of the community to vote on behalf of Island citizens to purchase the Superfund Site and thereby assume future liability at a later date. Even though the site was not remediated and remained a toxic mess, the purchase was promoted with the notion that if the city did not quickly purchase the Superfund Site, it would be developed by other interests, and the city would miss an opportunity. Despite legal long term institutional constraints associated with a Superfund Site of this magnitude, that would essentially make this impossible in our lifetime, until the site was properly remediated to a safe level, if ever. Especially since the hundreds of millions of dollars necessary to remediate the site properly in order to permit possible development, were not available and are yet to be a reality. As the Wyckoff Responsible Parties walked off into the sunset free and clear of future liability with the hazardous waste left behind for taxpayers and citizens to deal with for generations to come.

Islanders have been duped enough, and easily recognize how the EPA's poorly conceived plan further burdens the citizens with someone else's costly mess, including the significant health consequences to the community. Time for the EPA and our state representatives and elected officials, including our city council, to adopt an honest approach, and apply permanent clean up technology on some level to the site, and get on with actually addressing the hazardous waste that has yet to be adequately contained per the EPA's own reporting. Demonstrate the intentions to sell the Superfund Site to the citizens of Bainbridge Island for 8 million dollars was not a complete farce orchestrated by many state and federal level politicians and employees behind closed doors.

The Wyckoff family responsible for the Creosote Superfund Sites in the Puget Sound, including the one on Bainbridge Island, who profited from this operation, have donated millions of dollars to election campaigns including the current presidential race. They have proven to have a significant wealth portfolio. Perhaps they could be compelled to help make up the difference in costs associated with Thermal Destruction instead, of the short term ISS proposal, help the Washington State Seattle Bainbridge Community clean up the land to make a park we can all be proud of and enjoy with out putting our health at risk.

As a geologist, co-author of the Sole Source Aquifer Designation Petition, and a member of the community Wyckoff review team for two years, I strongly recommend a modified Alternative 6/Alternative A. Bainbridge has many intelligent involved citizens who are environmentally aware and would appreciate the EPA taking a more permanent solution with their proposed plan. Don't just simply build a new wall, apply thousands of tons of concrete slurry with a cap that will degrade with time, and call it a park, left to fester and further contaminate the environment and limited groundwater supply on Bainbridge Island. Do not unnecessarily relegate the site to costly long-term management requirements with ISS. The required future costs associated with ISS will far exceed the application of Thermal Destruction, which will lead to a more permanent removal and lasting long-term remediation efforts. Do not inadvertently limit the ability to engage rapidly developing future remediation technologies with questionable short-term ISS efforts.

Additionally, as I have stated in my public comments in April of 2016, the EPA, the City, and the Bainbridge Island Parks Department are remiss on avoiding adequately sampling the beach area that is falsely being promoted as clean and safe. There is no magic force field that stops the migration of known hazardous waste from the Upland area and the closed beach areas. All beach areas involved at the Wyckoff Superfund site are subject to intense wave, tidal and storm surges, that spreads the toxic waste further into Eagle Harbor, as we have already seen historically through sampling results. In the past the contamination has resurfaced onto the beaches, and new capping material had to be added to

limit exposure. To advertise to the public that the west beach is clean and safe without properly sampling on an annual basis for contamination is negligent. To subject citizens and other visitors without sample confirmation that the beach is in fact safe, and knowingly expose the community to cancer-causing toxins through simple dermal (skin) contact, borders on criminal behavior. Please demonstrate that the EPA is a responsible, honorable, intelligent, and capable government organization, and sample the beach annually, and post signage which provides the facts clearly, so visitors to the Superfund Site advertised as a park, can decide whether or not they want to expose themselves to toxic materials leaching from the large toxic contaminant mass. Most importantly, do not utilize the Superfund site ground water wells to supply drinking water to Island residents as previously considered.

Thank you for your time

(b) (6)

Resources

1. EPA Sole Source Aquifer Designation
2. Bainbridge Island Limited Groundwater Supply see USGS studies
3. https://www3.epa.gov/region10/pdf/sites/wyckoff-eagleharbor/factsheet-april2016.pdf
4. https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=1000612
5. Fact Sheet: EPA Proposed Additional Cleanup Actions (PDF) (4 pp, 1.2 MB) - April 2016

Comment 48

THE SUQUAMISH TRIBE

Post Office Box 498
Suquamish, WA 98392-0498
Phone (360) 598-3311
Fax (360) 394-3686

June 30, 2016

Helen Bottcher
U.S. Environmental Protection Agency
1200 Sixth Avenue, Suite 900 (ECL-113)
Seattle, WA 98101

Re: Wyckoff-Eagle Harbor Superfund Site
Proposed Plan for Amending the RODs for
Operable Units 1, 2, and 4

Dear Ms. Bottcher:

The Suquamish Tribe appreciates the opportunity to provide comments on the Proposed Plan for the cleanup alternatives proposed within Wyckoff – Eagle Harbor Superfund Site for Operable Unit (OU) 1, East Harbor Operable Unit, and OU2/OU4, Wyckoff Soil and Groundwater Operable Units.

The Suquamish Tribe is a signatory to the 1855 Treaty of Point Elliott. Under the articles of the Treaty, the Tribe ceded certain areas of its aboriginal lands to the United States and reserved various rights including the time immemorial custom to hunt, fish, and gather within its usual and accustomed grounds and stations, which was and continues to be the basis of the Tribe's source of food and culture. The Wyckoff-Eagle Harbor Superfund site is situated within the ceded territory and the adjudicated usual and accustomed fishing area of the Suquamish Tribe.

Treaty-reserved rights and resources are critical to the culture, health, and welfare of the Suquamish people. The Tribe's treaty-reserved right to harvest clams and other fishery resources within Eagle Harbor have been impacted from Wyckoff site contamination releases for decades. These hazardous substance releases have also affected the aquatic biota.

In 2008, the Tribe provided in writing its strong preference for the significant, or mass, removal of contaminants at the Wyckoff upland area, and that sediment contamination issues within the beach area of OU1 be addressed. The Tribe understands the complexities at the site and is supportive of current efforts to address these site contamination problems and to amend the record of decisions for these OUs.

The Tribe's comments on the remedial alternatives being proposed for the Upland Soil and Groundwater Operable Units and the Nearshore Area of the East Harbor Operable Unit, and on a risk assessment support document, are found below. The Tribe also acknowledges information included in the Proposed Plan on early site history (Section 3.1), and supports the language included in the document on natural habitat functions of the site (Section 4.3) and eelgrass beds (Section 4.4.3).

Upland Soil and Groundwater Operable Units (Alternatives 7 and 4)

The Suquamish Tribe supports in-situ solidification/solidification (ISS) of the core area and thermal-enhanced recovery (Upland Alternative 7), and the remedial action objectives (RAOs) proposed for the Soil and Groundwater Operable Units. However, the Tribe does have concerns associated with this alternative and requests further discussion on several common upland elements.

The timeframe for completing actions and achieving the RAOs under Alternative 7 is a concern for the Tribe. This alternative proposes 10 years of active construction followed by an additional 24 years of activities to achieve the RAOs. The Tribe requests that EPA further evaluate the schedule of actions under this alternative to reduce the timeframe needed to achieve the RAOs.

In the preferred alternative, the alignment of the new reinforced concrete wall was modified from the inside to the outside of the existing sheet pile wall (Section 10.2.1). The Tribe's preference is the inside alignment to avoid aquatic habitat impacts. In addition to the loss of beach habitat, the Tribe is concerned of potential impacts the outside alignment may have on eelgrass beds, shoreline structures and processes, and fishery resources. In the event EPA decides to move forward with an outside alignment, mitigation is required for the loss of beach habitat and for all impacts that are associated with this action.

The Tribe also requests continued discussions on the alignment and construction of the new stormwater outfall and any passive discharge of groundwater through the perimeter wall. The Tribe is concerned of water quality issues associated with these future discharges. It is important that the construction and discharge from the new stormwater outfall pipe avoids any potential impacts to shellfish growing area classifications within the Eagle Harbor area and to nearby eelgrass beds. The Tribe has spent well over a decade to upgrade the shellfish growing area classification of the Port Blakely and Tyee Shoal geoduck tracts to "Approved" for harvesting, and any negative impact to these tracts impacts the Tribe's treaty-reserved right to harvest. The Tribe also participated as an Elliott Bay Trustee Council representative on efforts to complete the nearby Milwaukee Dock eelgrass restoration project and the protection of this area is paramount.

The Tribe is considering supporting Upland Alternative 4 (ISS treatment for most of the upland area) if Tribal issues are satisfactorily and meaningfully addressed. These issues include (1) the on-site placement of a significantly larger volume of ISS-treated soils onsite, and (2) the construction and transportation requirements for the treatment of 352,000 cubic yards of soil

within a four-year construction period. A positive component of this alternative is the 12-year timeframe for completing actions required to achieve the RAOs.

Nearshore Area

The Tribe supports the partial excavation and capping alternative (Nearshore Alternative 3), and the RAOs proposed for the East Harbor Operable Unit. The Tribe, however, does not support the optional modification of Nearshore Alternative 3 (Section 10.2.2), in which contaminated soils from the beach would be treated using ISS technology and buried under the final on-site upland cap. The Tribe requests that contaminated sediments are disposed of at an off-site facility (i.e., landfill).

The Suquamish Tribe strongly supports the use of a shellfish target tissue concentration (Section 7.2.3) to assess the effectiveness of remedial actions in meeting the RAOs. It is important that response actions are implemented and assessed in order for the Tribe to be able to exercise its Treaty-reserved right to harvest clams and other fishery resources. The use of site-specific horse clam data collected from nonurban background location(s) to develop the target tissue concentration for carcinogenic PAHs is the Tribe's preferred approach.

Calculation of Preliminary Remedial Goals and Residual Goals and Residual Risk Estimates for the Wyckoff Superfund Site (April 6, 2016)

The Tribe requests that the above-referenced document be modified to include better delineation of Tribal fisher and recreational beach user exposure assumptions and estimated risks, correction of missing information in the tables, and removal of parameters that are not applicable to the Wyckoff site. The Tribe requests an opportunity to review the modified document before it is finalized.

We appreciate the opportunity to provide these comments, and look forward to our continued involvement on the Wyckoff-Eagle Harbor Superfund site.

Sincerely,

Richard Brooks
Environmental Program Manager

Cc: Hun Seak Park, Ecology

Comment 49

Bottcher, Helen

From: (b) (6)
Sent: Wednesday, July 06, 2016 10:20 PM
To: wyckoffcomments
Cc: Bottcher, Helen; Sherbina, Debra
Subject: Strongly recommend Alternative 6 over Alternative 7 for final Wyckoff Cleanup

Dear Superfund Cleanup Managers:

I strongly urge that EPA Superfund reconsider the use of Alternative 6 thermal destruction rather than adopt the solidification of contaminants in place in Alternative 7. Alternative 6 can be reduced by 25% costs by focusing on the removal of hotspots identified in the TarGOST studies; eliminating the thermal enhanced extraction aspect of the Alternative 6 option and focusing on the slower but proven aerobic bacterial breakdown of the deeper creosote and eliminating some of the costly aspects of the $40 million "common elements" that all EPA's alternatives have advertised.

Thermal destruction in Alternative 6 provides far more certainty for the safety of the environment and human health for both present and future generations of Washington State citizens than the riskier approach that would result with the adoption of the not completely proven technology of cement solidification in Alternative 7.

(b) (6)

Comment 50

Bottcher, Helen

From: Bottcher, Helen
Sent: Monday, July 11, 2016 1:17 PM
To: wyckoffcomments
Subject: FW: Wycoff/Eagle Harbor Proposed Plan

-----Original Message-----
From: (b) (6)
Sent: Friday, July 08, 2016 5:05 PM
To: Bottcher, Helen <Bottcher.Helen@epa.gov>; Sherbina, Debra <Sherbina.Debra@epa.gov>
Subject: Wycoff/Eagle Harbor Proposed Plan

I recently returned to find a guest column in my local newspaper, Bainbridge Islander, June 24, 2016 by Melanie Keenan and Malcolm Gander about this cleanup site.

I realize I am a few days past the deadline for public comment and I still would like to tell you that the proposals outlined by Keenan/Gander sound like a better long-range solution to this cleanup. To wit, the Alternative 6 permanent solution by thermal destruction not cement solidification.

I am not a professional in this field, but it is a sensible solution.

Very truly yours,

(b) (6)